1956
No. 7

VETERINARY Medicine

Established 1905

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features in this issue...

Zinc: In Parakeratosis and in Health

A Study of Inhalation Therapy in Large Animals

Advances Made in Swine Practice, Part VII: Swine Pox

Isolation of Listeria monocytogenes from Calves

Newer Advances in Corticoid Therapy

Intramedullary Fixation of Long Bones by Heterogeneous Bone Pins

Serpentine Tumors

Isolation of Distemper Virus

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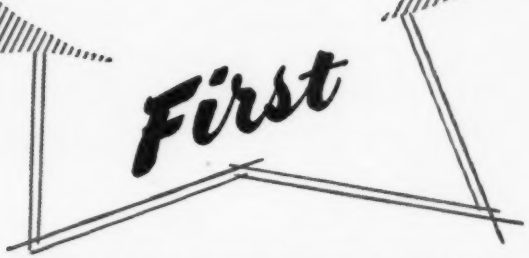

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Virus Pneumonia of Pigs

Some startling facts have been revealed with reference to a little known disease of young swine that suggests its major significance to the swine industry. Virus pneumonia of pigs (V.P.P.) perhaps is of even greater economic importance as a disease hazard than cholera.

At a seminar, sponsored by the technical and research staff of the Jensen-Salsbery Laboratories, held in Kansas City, Missouri, recently, Dr. Alan O. Betts, Department of Animal Pathology, University of Cambridge, England, stated that approximately 50% of swine exhibit lesions of V.P.P. at slaughter both in England and the United States and that firm experimental evidence suggests that the disease is responsible for significant reduction of growth rate (14-16%) and food conversion (22-25%). Doctor Betts has conducted extensive experiment and field trials on this disease in England for the past five years and since October 1955 has investigated a number of aspects of the disease as it occurs in this country. Investigation of control and eradication measures is being followed assiduously in current experiments and field trials.

The etiological agent of V.P.P. has been determined to be a virus having the characteristic of large size and specificity to swine lung tissue. An attack does not stimulate immunity. The condition is chronic persisting for months. Transmission has been observed from generation to generation. Infection is air borne. Affected pigs are virtually symptomless, except for coughing, so that growers are unaware of illness in the drove. Autopsy lesions of consolidation of the lungs on either side of the cardiac notch (apical and cardiac lobes), formerly passed off lightly as congenital atelectasis, are actually sharply circumscribed lesions of V.P.P. Disease free pigs do not exhibit such lesions.

Control and eradication is possible but difficult and tedious. Such efforts must have the full cooperation of growers. The seriousness of virus pneumonia of pigs is the "hidden" losses growers suffer because of its ravages. Emphasized by Doctor Betts also was the importance of the influence of the disease on nutrition and genetic studies. Under retarding influences of a disease among experimental animals of which the investigator is unaware, there is likelihood of false conclusion being drawn from results recorded.

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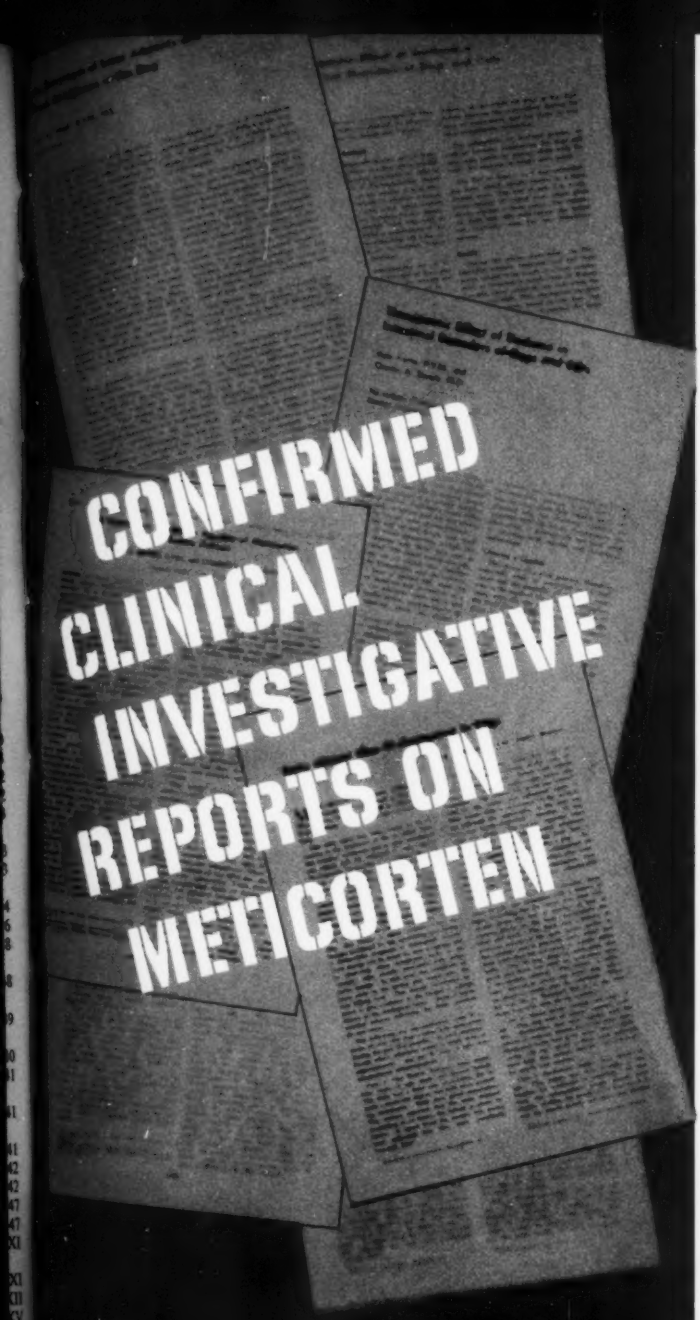

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EFERENCES

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Chambers, E. E.: North Am. Veterinarian 37:105 (Feb.) 1956.

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Morris, R. G., and Hall, C. E.: J. A. V. M. A. 128:132 (Feb. 1) 1956.

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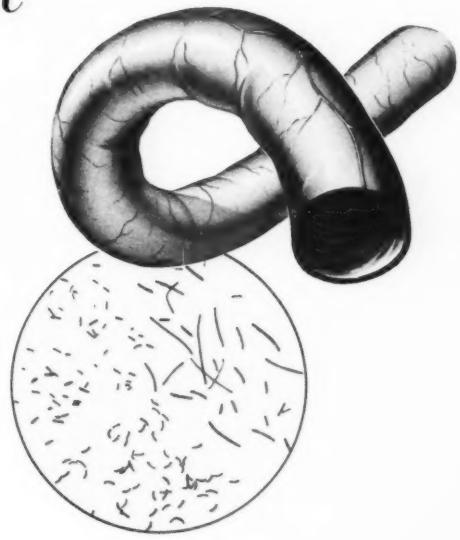

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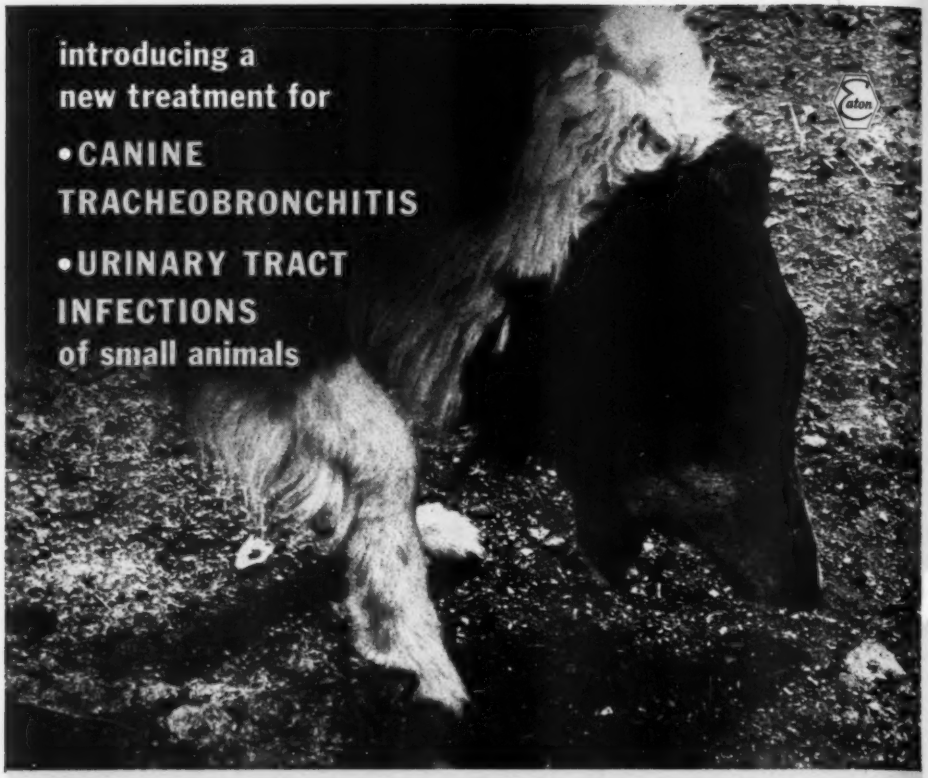

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1. Mosier, J. E.: Vet. M. 50:605, 1955. 2. Brookey, R. S.; Holt, S. H., and Siegel, D.: J. Michigan M. Soc. 54:805, 1955.

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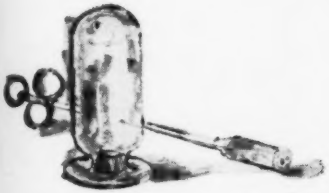

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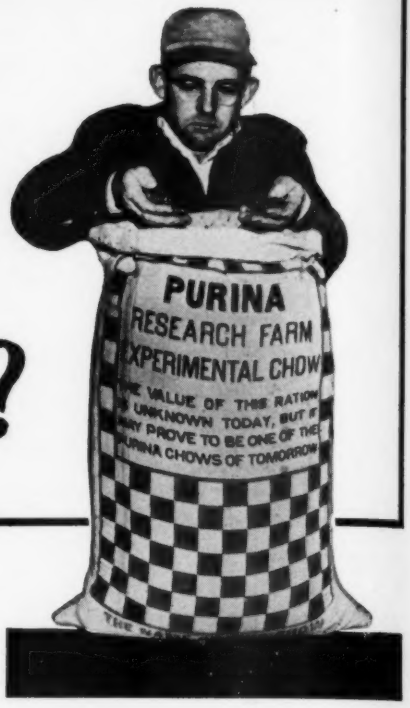

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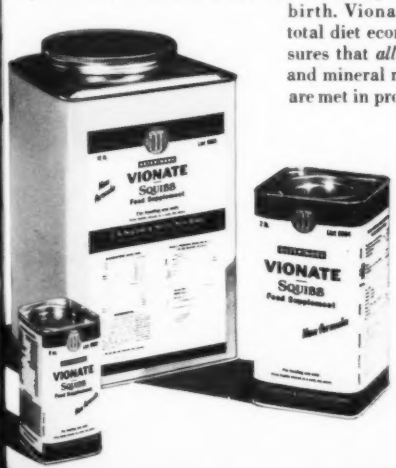

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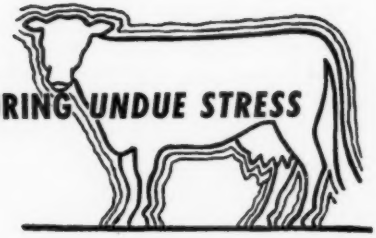

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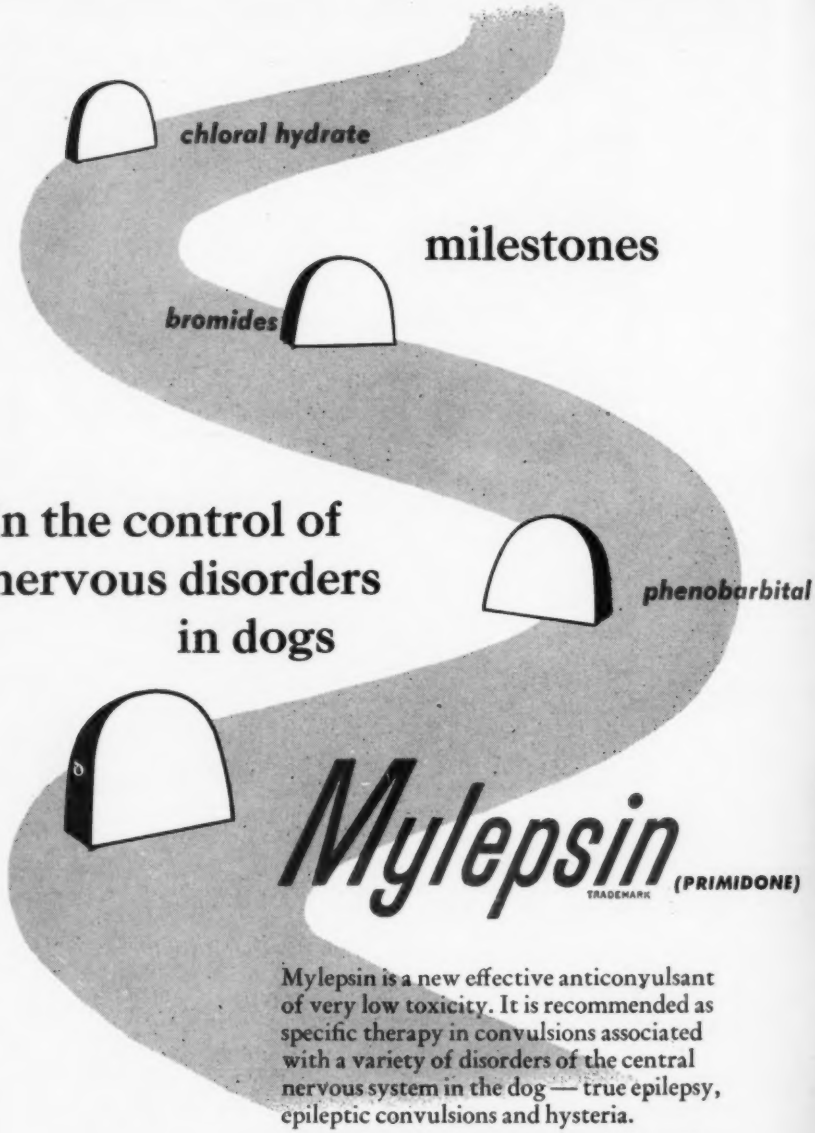

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TAIL SURGERY—Docked tail of 4-month-old pup is dressed with Aeroderm to avoid injury by licking and to keep wound clean. (Photo courtesy Dr. R. E. Miller, Richmond, Indiana.)

Two or three light coats of Aeroderm are sprayed directly onto the aseptic wound, allowing a few seconds for drying between coats. The tough, flexible, transparent film which forms guards against infection and abrasion while tissues repair normally. Aeroderm is impermeable to bacteria and outside contaminants. Aeroderm forms a protective coating to prevent excoriation by body discharges and promote healing of abraded areas.

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2. Watts, R.E.: J.A.V.M.A. 125:40 (July) 1954.
3. Wendt, W. E.: Personal communication (Sept.) 1954.
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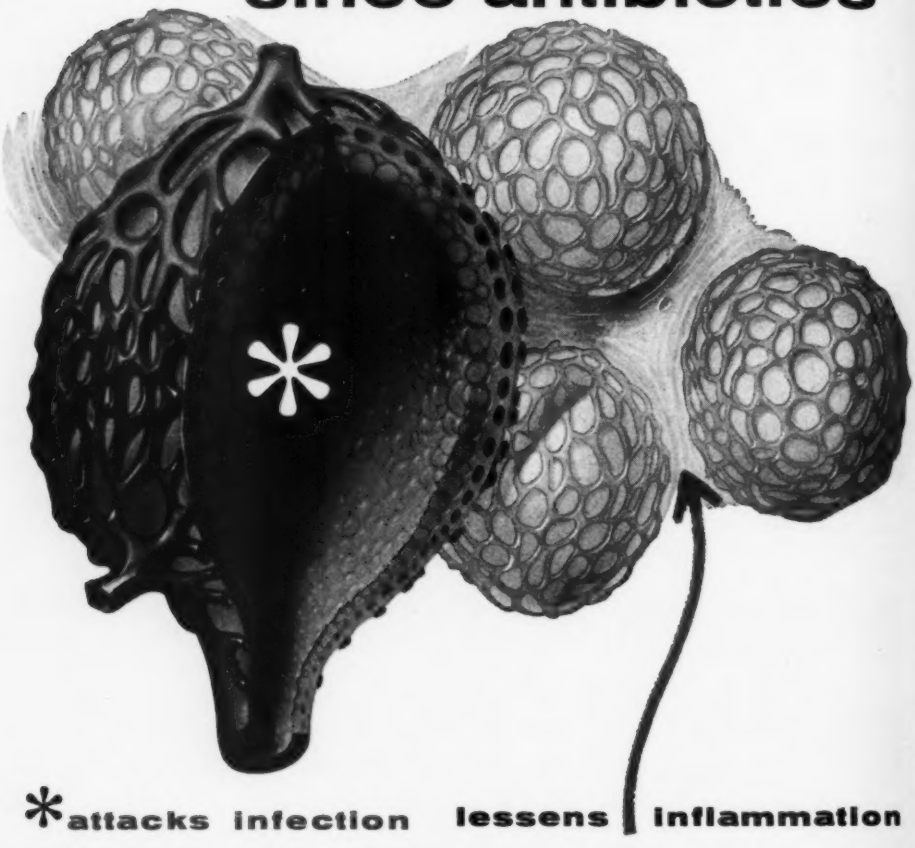

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Controlling the worms in cattle with new Pheno-Fortified Salt

Q. Why is worm control now important for beef and dairy cattle as well as sheep?

A. Research findings show that the great majority of beef and dairy animals also carry stomach and intestinal worms. Some infections are heavy and others are relatively light, and clinical symptoms may not always be apparent. But the condition is present—and it is costly everywhere, even in cold areas where winters were thought to suppress parasites. By USDA estimates, worms in cattle are now costing close to $40 million annually—almost equal to the figure for sheep.

Q. What new control program is being recommended?

A. After veterinary diagnosis, a worming dose or doses of phenothiazine should be given to young dairy animals, beef stock, feeder steers, or sheep. Then animals should be put on a *consistent low-level program* which supplies daily amounts of pheno. Long used for controlling worms in sheep, this practice has also proved effective in preventing cattle from becoming reinfected.

Q. Why is phenothiazine in salt especially effective for low-level feeding?

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CATTLE-GRUB CONTROL: Two-year tests at the U. S. Regional Animal Disease Control Laboratory, Auburn, Ala., show that pheno (in a mixture with salt) fed free choice can result in considerably lighter infestations of cattle grubs. Treated animals had one-eighth as many grubs as the untreated.

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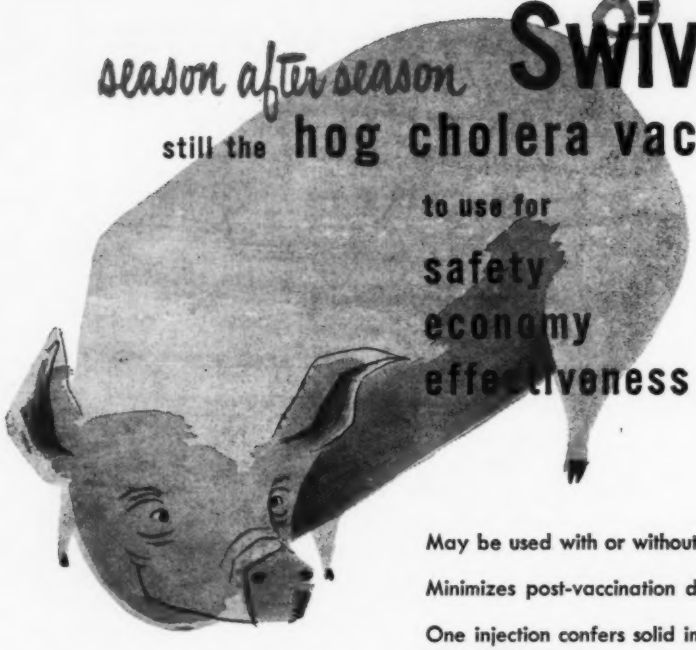

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Zinc: In Parakeratosis And In Health

R. C. KLUSSENDORF,* D.V.M., Terre Haute, Indiana

PARAKERATOSIS of swine has been linked with a deficiency of zinc in the ration. It has been reported that the condition is more severe when calcium is present in abundance[1]. Parakeratosis may appear in pigs on a good ration containing zinc at the rate of 44 parts per million (p.p.m.)[2]. Recovery was rapid when the zinc was increased to 100 p.p.m.[3] with no other change in the ration. Rate of gain following the addition of zinc to a parakeratosis-producing ration resulted in increasing the rate of gain by from 43 to 83%[4] over that of controls maintained on the original ration. In herds and areas where parakeratosis occurs annually, adding zinc to the creep feed is recommended as a preventive[5].

This increased interest in zinc, and its appearance in formulated feeds, justifies a review of the information as reported in text books and scientific journals. The findings of such a survey are offered herewith, not as new information but only to share it with practitioners who do not have the time nor the library facilities for a full-scale review.

Zinc is Essential

Zinc long has been recognized as an essential element in the metabolism of all vertebrates[6]. This was true even before a specific function could be assigned to it, and when deficiency was believed to occur experimentally only. The data need to be restudied, now that a spontaneous deficiency has apparently been observed under normal farm conditions. Approval by the Food and Drug Administration of the zinc salt of bacitracin for use in throat lozenges and other pharmaceutical preparations adds to the timeliness of this review.

Another statement which has been generally accepted states that, "It is highly improbable that any amount of zinc likely to be absorbed with foodstuffs would exercise a deleterious effect on health"[7]. The statement was made with reference to normal human foods. It is important to know if it applies to supplemented or medicated animal feeds in which the zinc may be supplied as a free chemical rather than as a mineral component of the plant. The limits within which such supplementation is advantageous should also be determined.

Distribution in the Body

Zinc is distributed throughout the body, but is concentrated in the soft tissues and the blood[8]. It occurs in the bodies of land animals in much greater quantities than copper and manganese, but is distributed in much the same way.

Some typical organ analyses, showing the amount of zinc, on a dry basis, are:

Liver	245 p.p.m.
Muscles	226
Kidneys	186
Pancreas	135
Heart	100
Adrenals	82

*Director, Veterinary Medical Services, Commercial Solvents Corp.

Spleen	72
Lungs	67
Cerebellum	55
Cerebrum	43
Hair	255
Nails	197
Epidermis	97

Milk contains 3 to 4 micrograms per cc. and large amounts are found in the corneal epithelium, iris, retina, and lens. Whole blood contains almost 9 micrograms per cc. and of this 75% is in the erythrocytes, 22% in the plasma, and 3% in the leukocytes[9]. In leukemia, the zinc of the leukocytes falls to 10% of the normal, and in leukopenia it is increased 3-to-10-fold[10]. In pernicious anemia, the zinc content of the erythrocytes is markedly elevated, but drops back to normal when liver is fed[11].

When making tissue assays, most of the zinc appears in the acid soluble fraction or protein-free filtrate, less than 1% being apparently bound firmly with the proteins[12]. The nuclei of the cells contain little zinc, being scarcely measurable.

Symptoms of Deficiency

Mice fed less than 0.5 mg. of zinc per kg. died in 14 to 23 days, and when the ration contained 20 p.p.m. they lived 57 days[13].

Rats fed a ration containing marginal amounts of zinc develop a variety of manifestations,[14] many of which affect the epidermis and the epidermal structures (hair follicles, nails, sebaceous glands) and the mucous membranes. Other early manifestations are failure to grow, anemia, hyperirritability and extreme

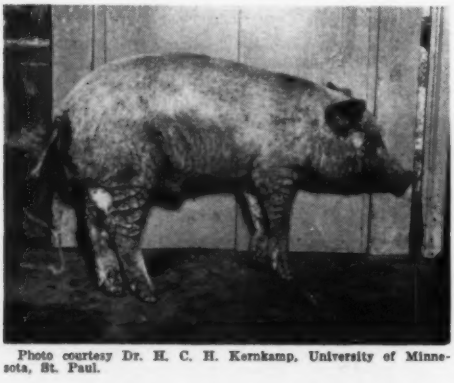

Photo courtesy Dr. H. C. H. Kernkamp, University of Minnesota, St. Paul.

Fig. 1. Advanced parakeratosis. Skin is thickened and crusty. Emaciation and ill health are progressive symptoms.

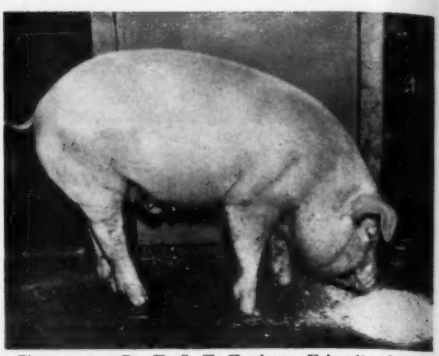

Photo courtesy Dr. H. C. H. Kernkamp, University of Minnesota, St. Paul.

Fig. 2. Pig illustrated in figure 1, 73 days later. Zinc had been added to rations.

activity, and sometimes early eruption of incisors.

The hair begins to thin after three weeks on a low zinc ration, and the fur is soft, woolly, and lusterless in six to seven weeks, with alopecia developing over the shoulders, the back of the neck, and the face. The black areas turn to gray. The skin is thickened and eczematous, but not inflamed. The nuclei of the cells are pyknotic. The skin which normally has three or four layers of cells in the epidermis now has eight or ten layers, and the outer layers are keratinized. Edema is present in the cells and the intercellular spaces. In advanced cases, the tail, ears, and ends of extremities may be involved—clubbed digits and deformed fingernails and toenails.

The mucous membranes are also involved, especially in the mouth and the esophagus. Instead of the normal two or three layers of cells, there may be 10 or 12 layers; the outer ones being keratinized, the deep ones edematous.

Failure to grow is, in part, due to lack of appetite, but also to inability to utilize the feed consumed. Feed consumption may be down 20 to 30%, while at the same time 50% more feed may be required to produce a unit of gain[15]. Emaciation and general ill health are progressive.

Failure to grow involves not only the soft tissues, but the skeleton as well; and ossification is retarded along with actual size. Meantime, the zinc content of the bones falls below normal while that of the muscles and soft tissues is relatively unaffected.

The anemia is microcytic (small red corpuscles) and hypochromic in character[16], indicating failure to attain the usual size as well

as inability to synthesize hemoglobin normally. This is accompanied by a high (doubled) uric acid content in the blood, apparently due to increased uric acid formation rather than to poor destruction. Meantime, the blood alkaline phosphatase and the pancreatic amylase are low, as is liver catalase activity. The latter is probably an indirect effect, since it can not be corrected by adding zinc.

The extreme activity and hyperirritability[13] may be indicative of thyroid hyperplasia from a mildly goitrogenic action of the zinc[16].

Early eruption of the incisors was noted in some groups[6], but not in others[17]. Ataxia has been mentioned[6] and an infertility in heifers in Vienna was believed caused by zinc deficiency, since it responded to administration of zinc oxide[12].

Deficiencies of iron and zinc often occur concommitantly, and in parallel degree[11].

Producing a Deficiency

Earlier reports have suggested that it would be exceedingly difficult to formulate a ration for farm animals which would be so low in zinc as to interfere with normal development, because most forage and pasture plants contain from 30 to 100 p.p.m. of this mineral (dry basis)[8], while the deficiency symptoms in rats and mice are produced only by rations containing as little as 0.3 to 1.6 p.p.m. The deficiency ration would, therefore, contain a minimum of forage and pasture, and these would be grown on soil high in organic matter, on leached sands, or on gravel—all of which are low in zinc.

The low zinc ration would eliminate colostrum and milk. Normal milk is relatively high in zinc (10:1 as compared to copper and 50:1 for manganese), while colostrum contains three or four times as much zinc as does normal milk. This would reduce calcium also, which in the light of present knowledge, would tend to maintain normal body balance and minimize or delay the appearance of symptoms of zinc deficiency.

The conditions existing on farms where parakeratosis of pigs appears spontaneously have not been sufficiently studied to account for a zinc deficiency under ordinary management conditions. It would seem that nutrition is more important than management, in that the ingredients of today's rations may contain more calcium as a result of soil liming programs on some farms and in some areas. Raising the calcium content of a good ration by increasing the ground limestone from the usual 1 to 2% definitely increased the incidence and severity of parakeratosis[8]. Raising the zinc content of the ration at the same time as the calcium retards or prevents appearance of symptoms. Zinc must be added judiciously, but present evidence suggests that no toxic or unfavorable reaction is observed when the ration contains zinc at the rate of 1,000 p.p.m.[8].

In summary, it appears quite evident that producing zinc deficiency is easier when an abundance or surplus of calcium is present in the ration, or when the normal calcium: phosphorus balance has been disturbed. In other words, zinc must not only be present, it must be available.

Other than parakeratosis of pigs, zinc deficiency has not been recognized in farm animals, and reports of studies to produce them have not been found in the literature.

Symptoms of Toxicity

In man, large doses administered orally cause nausea, vomiting, diarrhea, and abdom-

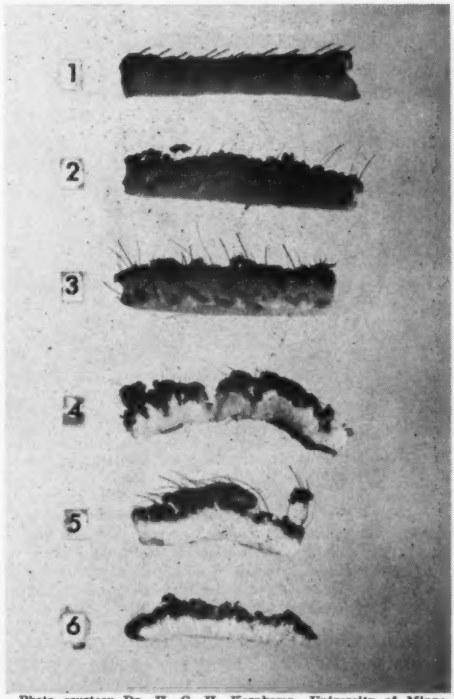

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Fig. 3. Sections of skin cut perpendicular to body surface to illustrate thickness of crusts and irregular contour of epidermal zone. Section 1 is from normal skin; sections 2 to 6 inclusive, from parakeratotic skin.

inal pain. The toxic human dose is given as 2 mg. per kg. as zinc gluconate[6], but 300 mg. per day was well tolerated in a test with dogs[11]. Persons exposed to fumes for a long time develop a condition called zinc fever, brass ague, or spelter shakes[7]. However, long exposure to dust (zinc, zinc oxide, and zinc sulfate) did not result in evidence of injury.

In rats, 1% of zinc (as carbonate) in the diet caused a severe anemia in three to five weeks, and resulted in a failure to reproduce. If continued, the rats failed to grow and died in six weeks. At 0.7% of the diet, anemia appeared at four weeks and the rats lived longer. The anemia was corrected by adding copper, iron, and cobalt to the ration, and additional work[12] suggests an interrelationship with copper, molybdenum, and lead which may be important in the anemia problem. Correcting the anemia did not restore normal growth, however. Feeding excessive amounts of zinc chloride to rats causes a toxicity syndrome which may be corrected by feeding added calcium pantothenate.

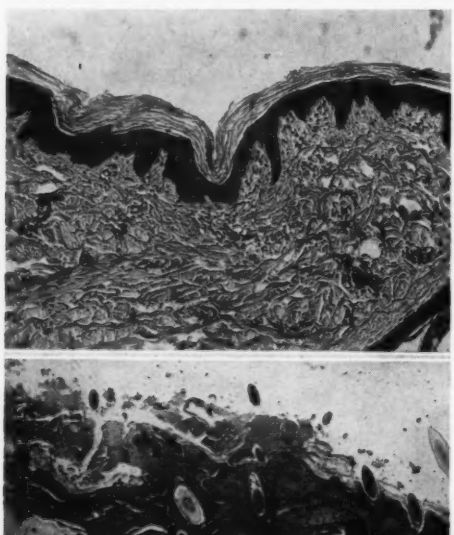

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Fig. 4. Photomicrograph of normal skin (upper) and parakeratotic skin (lower). Note relatively thin layers of stratum corneum of normal skin and the fact that it is free of nuclei. Note marked thickening of stratum corneum in skin from pig suffering parakeratosis (lower) and the vast number of nuclei and nuclear substances present in it.

Dogs tolerated 2 mg. per kg. intravenously (as zinc chloride), but double this dose caused lassitude, decreased tendon reflexes, bloody enteritis and diarrhea, and paresis of the posterior limbs. The general picture was similar to that of potassium toxicity[11]. However, zinc carbonate has been fed to dogs in large doses for months, with no evidence of chronic injury[19].

Cats developed pancreatic fibrosis when fed doses varying from 0.5 to 10% of the total diet (as zinc oxide). On the latter, the cats lived about four weeks. Anemia was noted regularly, and immature erythrocytes were seen in the terminal stages in each case, suggesting impaired production of red cells for replacement. An excess of leukocytes was also seen terminally.

Lambs in Australia suffer from enzootic ataxia, and in England from swayback, both believed caused by an excess of zinc in the forage[15], especially when coupled with a high lead intake and a high ratio of calcium:phosphorus.

Zinc salts are used topically for their astringent action, and when administered orally or parenterally they depress the central nervous system and precipitate protein.

Metabolic Role

The most active turnover of zinc (rapid absorption and rapid excretion) occurs in the pancreas, liver, kidney, and pituitary gland. The least active turnover (or largest retention) is in the erythrocytes, brain, skeletal muscle, bones, and skin, with accumulation only in the erythrocytes and bones.

Many manifestations of the effects of too little or too much zinc are recognized, although the minimum daily requirements have not been established and little is known of the precise role it plays in the biologic processes. The average daily human intake on a normal well-balanced diet is said to be 12 mg.[8] and the zinc balance may be maintained on an intake of 6.6 mg. per day[20]. Hence, most of the food-ingested zinc is eliminated in the feces and remains unabsorbed. Urine excretion varies but little with increased or decreased ingestion.

In general, a low zinc consumption results in a low tissue content, but a high zinc intake results in only slight increases. The level of zinc in milk is increased when added amounts are fed to the cows.

The enzyme systems are profoundly affected

by zinc. Of these, carbonic anhydrase has been studied most intensively, and zinc has been proved to be a necessary part of the molecule[11]. Carbonic anhydrase regulates the process of combining CO_2 with a substrate, and later releasing it. This would involve combining with CO_2 in the tissues and releasing it in the lungs. Although this activity is altered by many other substances, the carbonic anhydrase activity closely parallels the zinc content of the erythrocytes, and the enzyme is present in large amounts in mammalian blood (1% of the hemoglobin in the pig, and somewhat less in that of the dog). The enzyme is also present in the gastric mucosa, where it regulates the production of hydrochloric acid, and in the renal cortex, and is involved in other metabolic functions.

Zinc may also be essential to the phosphatase molecule[21], but this has not been definitely established. This would include kidney phosphatase which helps to control the urinary pH at the renal tubules.

Zinc activates the intestinal phosphatase in the presence of amino acids. When zinc is deficient, protein metabolism is disturbed, there being a distinct delay in reaching a maximum level of blood nitrogen, as well as a lower plasma content, and a disturbed amino acid metabolism. Presence of zinc activates the proteinase leucyldiglycinase and promotes a return to normal.

Pancreatic amylase is reduced, and its proteolytic activity is reduced on a zinc-low diet. The activity can not be restored by adding zinc to the tissues, either *in vitro* or *in vivo*. Zinc, however, appears to have no effect on crystalline pepsin or trypsin. When zinc is low, glucose tolerance curves are delayed and irregular, but blood sugar and liver glycogen remain normal and there is no glycosuria. This suggests delayed absorption of glucose from the gastrointestinal tract.

The rapid turnover of the zinc in the pancreas bespeaks an important role, excretion being in the pancreatic juice. It was thought to be necessary to the insulin molecule, since it is used in producing crystalline insulin. However, amorphous insulin is just as active, so the need for zinc remains questionable. Adding zinc to insulin delays the physiologic action and prolongs hypoglycemia when it is present. However, the zinc content of the pancreas is not noticeably low in diabetes.

Estrone is converted to estradiol in the presence of zinc, and the estrogen titers in urine are markedly increased by its presence[28].

The role of zinc in the leukocytes is completely unknown, although the zinc content of these cells drops dramatically (as much as 90%) in leukemia, and increases three to ten times in leukopenia.

Zinc deficiency results in increased acid production by fungi[28]. However, zinc in physiologic concentrations has no effect on pyruvic carboxylase, a tryptophan-synthesizing enzyme, alcohol dehydrogenase, or diphosphopyridine nucleotidase, in cultures of Neurospora.

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(Continued on page 310)

A Study Of Inhalation Therapy In Large Animals

William O. Reed, D.V.M., and M. E. Glasser*, B. S., Hialeah, Florida

WITH the introduction of specifically designed equipment for administration of oxygen and ether inhalation therapy in small animals,[1,2,3,4] considerable interest has been created relative to the adoption of similar procedures in large animal practice. Veterinarians interested in adopting the use of oxygen for both its life-saving and therapeutic qualities, have been handicapped by lack of practical, simple apparatus.

Administration of 100% oxygen leads to investigation of several interesting problems. The effects of high oxygen concentration in anoxic states, shock, anemia, and for postsurgery use are classic. Raising oxygen concentration of arterial blood, plus the additional oxygen carried in simple solution in the plasma, due to to the inhalation of 100% oxygen, favorably influences ability of the animal to recover quickly from physical stress.

The respilator with aerosol attachment is a portable unit designed for administration of 100% oxygen and aerosol by operators who have minimum supervision and training. Oxygen therapy, first used in acute lung disturbances, such as pneumonia, atelectasis of newborn, and massive lung collapse was extended to postoperative conditions, bronchopneumonia, heart failure, prevention of impairment of cerebral function, anoxia, shock, and instances of cardiac and respiratory failure. The use of chemotherapeutic aerosols was prompted by the studies of Castex and Capdehourat which illustrated that nebulized solutions penetrate the smallest bronchi and reach the alveoli.

Because of the wide field covered in a study of inhalation therapy, considerably beyond the scope of any one paper, this report will be primarily concerned with practical aspects. The writers have borrowed freely theories and methods well established in human medicine and small animal practice, with the intent of devising simple, practical, and effective procedures for inhalation therapy for large animals. The initial introduction of such equipment opens vistas of advances and improvements both therapeutic and surgical. It is hoped that this limited study will stimulate further research in this promising field to develope the possible values of inhalation therapy in pathological processes.

A Physiologically Designed Oxygen Mask for Large Animals

Early attempts to use existing equipment on large animals have been discouraging. Among the most significant problems was that created by noise of the apparatus that excited patients. In order to approximate the therapeutic dosage needed in treating horses, pronounced pressure increases were imperative. The noise created (in passing the needed volume through a standard pressure regulating device) frightened animals beyond control. Various makes of regulators with many modifications were tried with little success. Then too, the only means available for administering the oxygen were crude and costly. It was difficult to administer and almost impossible to achieve physiologically sound therapy. Various hoods were tried and found inadequate either because of excessive negative pressure, or accumulation of carbon dioxide with or without positive pressure against exhalation. Because of the nature of the horses treated, deviations from readily accepted procedures were to be avoided.

The respilator† was desined as a simple, economical, and safe mask for administering controlled oxygen concentrations to horses and other large animals. Consideration was given the following: (a) Control of the oxygen percentage of the inspired air, (b) reduction of inspiratory pressure to near atmospheric pressure, (c) exhalation at ambient pressure, (d) reduction of noise to permit administration without exciting animals, (e) prevention of excessive accumulation of carbon dioxide, (f) supplying exaggerated requirements of distressed animals, and, (g) adapting unit with minor modifications to administer aerosols, resuscitation, and inhalation anesthesia.

This specially designed respilator, unlike standard oxygen equipment, consists of a triple

*Inhalation therapist.

†The respilator used in these studies was developed by the Research Division, Professional Veterinary Service, 819 S. W. 12th Ave., Miami, Florida.

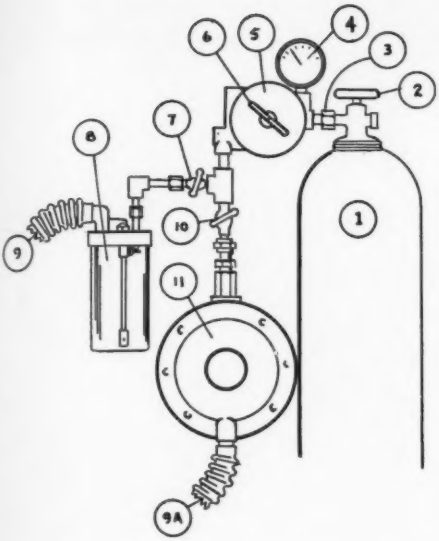


Diagram 1. Respilator: (1) Standard oxygen cylinder, (2) cylinder valve, (3) regulator attachment, (4) cylinder contents indicator gauge, (5) oxygen regulator, (6) pressure adjusting screw handle, (7) by-pass needle valve for aerosol administration, (8) jet nebulizer, (9 or 9A) corrugated tube, (10) shut-off valve for oxygen mask, (11) 10-in. third stage reduction diaphragm.

reduction oxygen pressure apparatus (see diagram 1 [5]), a by-pass needle valve for aerosol administration [7], and a physiologically designed face mask. The oxygen pressure from a standard cylinder [2] (2,200 P.S.I.) when full, is successively reduced in three calibrated stages with the final reduction effected by an extra large 10-in. diaphragm[11] which permits the flow of high volumes of oxygen at a minimum pressure with minimum noise. In treating respiratory embarassment, the large volume, low pressure oxygen is passed through a corrugated tube 18 feet long [9 or 9A] which further serves to reduce noise. Oxygen passes into a 60 liter latex breathing bag, (diagram 2 [2]) which is secured to a plastic face mask [3]. Upon inhalation, the inspiratory valves [8] open readily to admit oxygen. Upon exhalation the flutter valves [4], directly opposite the animal's nares, open to allow exhaled air to escape. As an added safeguard, an additional inspiratory valve [5] is provided to open easily should the animal require a greater volume of air than that being delivered. A single pressure adjusting screw handle controls (diagram 1 [6]) the needed amount of oxygen. Operational instructions are simple. No technical training is required to operate the unit.

Because of the semi-demand feature of the mask it is necessary to turn the oxygen up sufficiently to keep the breathing bag partially inflated. Should the bag collapse upon exhalation, insufficient oxygen is being admitted. On the other hand, should the bag remain constantly inflated, an excess of oxygen is being used. Such excess can not harm the animal, nor can it produce unwanted pressure since it will be blown off through the exhalation valves. An inflatable cushion (diagram 2 [6]) at the terminal end of the mask serves to create a comfortable air-tight fit. The plastic mask body proper is designed to reduce dead space

Fig. 1. Respilator with dual attachment for administration of 100% oxygen (r.), for administration of aerosol (l.).

to the minimum, thus preventing an accumulation of carbon dioxide.

All portions of the mask are readily assembled or taken down for sterilization or cleaning. The resemblance of the mask to a feed bag, and provisions for reducing hissing noise of rushing gases, makes the unit acceptable and useful. The writers have experienced no difficulty in administration.

Provision for Aerosol Administration

The new respilator is designed to facilitate the administration of various solutions or antibiotics in aerosol form. For this the mask is quickly converted to an aerosol unit by removing the two inhalation valves at the base of the mask, (diagram 2 [8]), and by attaching the oxygen hose to the jet nebulizer, (diagram 1 [8]) used to generate a high volume of fine mist. The fineness of particles determine the degree of penetration or saturation of the solution or medicant being administered. The solution to be used is placed in the 300 cc. plastic nebulizer (diagram 1 [8]) attached to the multistage regulator. The needle valve [7] is opened sufficiently to produce a mist. Aerosol treatments are generally of short duration, about 10 to 15 minutes. Because it is better to have the animal breathe the mist deeply, rebreathing of approximately 7% carbon dioxide stimulates respiration with no ill effect. Respiratory stimulation enhances the amount of mist inhaled. Use of a number of therapeutic agents in suitable diluents are well known for their remedial effect in upper respiratory infections.

Surgical Respilator-Aid (Diagram 3)

In recognition of more specialized needs and requirements of large animal practitioners, both for surgery and treatment, a combination unit was developed. The respilator-aid consists of a modified M.S.A. demand pneophore [6] utilizing the Burns valve [10] for intermittent positive pressure, combined with the N. C. G. jet nebulizer [7] for aerosol inhalation, a modified respilator mask [11], and the Stanton aspirator [4].

The unit is compact and light weight. It may be attached to any standard size oxygen cylinder and readily adapted to a 60 cubic foot oxygen cylinder (approximately 40 lb.) as a portable unit.

The respilator-aid administers 100% oxygen on demand. While breathing voluntarily, the animal controls both the rate and depth of respiration. Should the animal develop respiratory

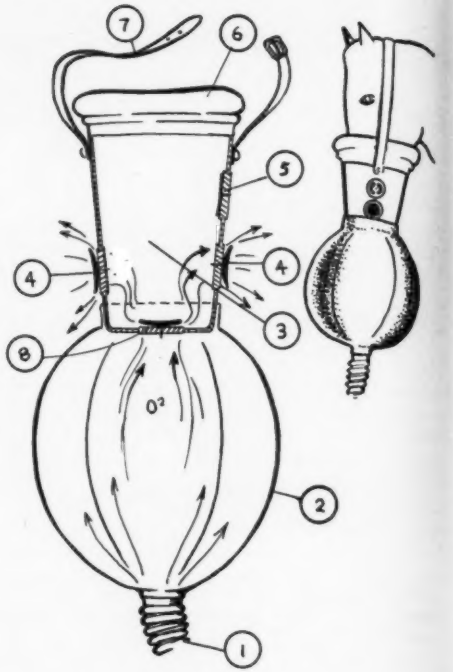
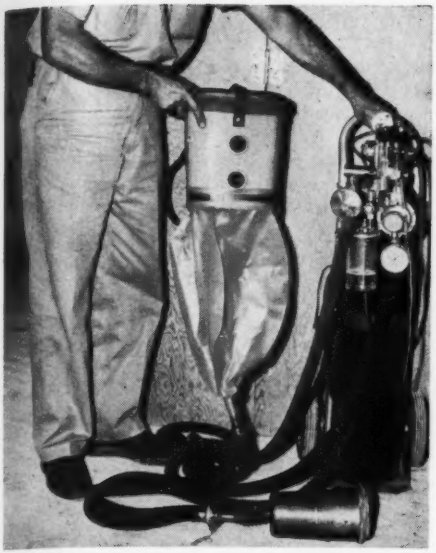


Diagram 2. Respilator Mask: (1) Corrugated hose, (2) latex breathing bag, (3) plastic face mask, (4) exhalation valves, (5) safety inspiratory valve, (6) inflatable cushion, (7) retaining harness straps, (8) inspiratory valves.

difficulty or arrest, the unit begins automatic rhythmic cycling thus keeping the lungs ventilated and under positive pressure inflation. A single dial control [8] allows an increase or decrease in lung inflation. The fact that the conversion from inhalation to resuscitation is automatic enables more complete attention without concern over ventilation. As the animal begins voluntary breathing, the conversion from rhythmic automatic cycling to demand inhalation is accomplished with no manipulations necessary by the operator. For use as a surgical aid in all involved procedures, as an aid in postoperative recovery and for easier and earlier relief from anethesia, the respilator-aid employs a modified respilator mask attached to the Burns valve. This mask (diagram 2) consists of a lightweight anatomical [3] shaped plastic body with a form-fitting inflatable cushion [6] to effect a closed system.

As a further aid in postoperative recovery and for the reduction of respiratory involvement, the respilator-aid is equipped with a jet



Respilator Aid Veterinary Surgical - Therapeutic Unit: (1) Mask on floor for oxygenation and resuscitation of newborn, (2) mask (upper left) for resuscitation and auxiliary oxygenation during surgery, (3) modification of valves in mask permit use of unit for aerosol therapy.

nebulizer. The latter enables administration of wetting agents both with and without antibiotics simultaneous with the administration of oxygen. Safe and satisfactory general anesthesia depends upon maintaining an open airway and adequate oxygen supply.

In using aerosol (diagram 3) with this unit, a needle valve [5] is opened to administer the mist. The N. C. G. jet nebulizer [7] is utilized with a corrugated hose [9 or 9A] connected to the mask at the three-way connector [10].

Resuscitator for the Newborn

The respilator-aid has proved useful in resuscitation of the newborn. In valuable animals, particularly where there is concern over normal birth, it is recognized that availability of oxygen and some form of resuscitation are valuable. Here again the problem of a simple, economical, and effective instrument to aid the newborn during the early difficulties presented itself. The respilator-aid fulfilled all requirements in this respect. With the substitution of a smaller sized mask [11] oxygen could be administered to the newborn. Again, where the foal breathes naturally, the unit will supply oxygen upon demand. Should the newborn develop distress the unit functions as an automatic respirator. If at any time the airway is obstructed, the cycling valve will chatter or cycle rapidly indicating the need for aspiration of the trachea to maintain patent airway. As a matter of convenience and completeness in cases where the respilator-aid had been used for newborn, a suction unit should be substituted for the nebulizer. In so doing, simple depression of the suction bottle valve [3] permits immediate suction to aspirate the animal, and allow immediate replacement of mask.

When the animal shows signs of ability to continue on its own, the unit may be removed. A universal adapter is used for both the aspirator and nebulizer making them interchangeable.

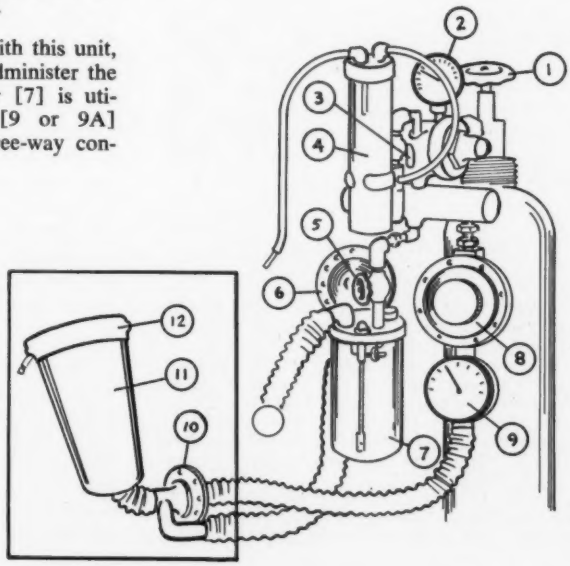


Diagram 3. Surgical Respilator-Aid: (1) Cylinder valve, (2) cylinder contents gauge, (3) aspirator valve handle, (4) Stanton aspirator, (5) nebulizer needle valve, (6) M.S.A. demand pneophore, (7) N.C.G. jet nebulizer, (8) pressure control valve, (9) positive pressure gauge, (10) Burns valve, (11) modified closed circuit mask, (12) inflatable cushion.

Summary

An oxygen apparatus is presented which permits administration of 100% oxygen to large animals. Special regulation has been devised to reduce incidence of excessive pressures and noises. Inspiratory valves between the latex breathing bag and the mask prevent the rebreathing of exhaled air. Modification of the equipment is provided to permit large volumes of easily supplied aerosol mist for the treatment of upper respiratory conditions. A second unit is described to provide resuscitation and surgical and postsurgical oxygen administration.

No attempt is made to present a clinical or statistical study at this time. It is expected that the writers will later present additional findings, and it is hoped this will stimulate inhalation studies by others.

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The article entitled, Host Resistance to Bacteria in Traumatic Shock, by-line of Dr. Jacob Fine, that appeared in VETERINARY MEDICINE for April 1956 (page 180) was, as noted, compiled from stenotypist notes. It was not a reproduction of manuscript submitted by Doctor Fine nor a verbatim recording of his address, nor did he have opportunty for editing prior to its publication.

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Parakeratosis in Swine

(Continued from page 305)

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Professional Fees

Action taken by the California Medical Association, having a membership of 14,000, to adopt a fee schedule guide, contains features that may be applied by veterinarians. This action is the first of its type taken by a major medical body in the United States and climaxes two years of study by a Committee headed by a Dr. Francis J. Cox of San Francisco. According to a report in *Medical News* (Apr. 9, 1956) the proposal gained favorable response spontaneously.

The plan differs from usual fee scheduling proposals in that it is based on the relative values of specific services instead of their dollar value. A "code book" has been prepared covering 1,200 procedures under four major schedules: Medicine, surgery, radiology, and pathology. It is a rate calculator giving a unit value for each procedure. Any physician who has established a fee for a single procedure can consult the code book and by applying an arithmetical formula, arrive at the figure he should charge for another service or procedure.

An acceptable unit value table might be worked out for veterinary services which would, at least, assure consistency of charges in proportion to their professional values. In this manner, the practitioner and client would benefit in the knowledge of a fixed yet flexible fee standard. The practitioner would need only a single charge such as that for an office call, which would serve as a base for all services. A hypothetical example of the manner in which this might be applied is taken from the issue of *Medicine News* noted above. A veterinarian may have established a fee of $3. for an office call having a unit value of 6. His correct charge for Cesarean section in a bitch (unit value 50) may be easily computed: 3 is to 6 as X is to 50; $6X = 150$; $X = \$25$, computed fee for surgery.

This type of procedure allows freedom to set individual fees, yet provides a guide for comparison and to show clients who question charges for unusual or special procedures with which they are unfamiliar.

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Heavy hogs are sensitive to high temperatures, warns Livestock Conservation, Inc., in a news release to the farm press. Emphasized is the fact that only a limited portion of the skin contain sweat glands which aid in body heat control. Shippers are cautioned to exercise practices designed to keep animals as cool as possible during movement in unseasonable hot weather.

Advances Made In Swine Practice

H. C. SMITH,* D.V.M., Sioux City, Iowa

Part VII: Swine Pox

Readers are referred to the following previous issues of VETERINARY MEDICINE for Parts I to VI of this series by Dr. H. C. Smith: 50:565 (Nov), 1955; 50:683 (Dec.), 1955; 51:33 (Jan.), 1956; 51:61 (Feb.), 1956; 51:102 (Mar.), 1956; and 51:262 (June), 1956.

Swine pox is an eruptive disease of the skin ordinarily considered as a form of varicella. Manifestation of infection, however vary widely in practice and this common disease often undiagnosed. Infestation of external parasites is almost always associated with symptoms and any biting parasite may be vectors of the causative virus. Infected droves are frequently louse infested.

Doctor Smith suggests advantages of a satisfactory vaccine, so far not available, for prophylactic vaccination.

THE virus that causes swine pox is closely related to vaccinia and small pox. The eruptive changes develop principally along the belly and inner sides of the legs, although they may cover the entire body, particularly in young swine. The first changes noted are red elevated areas about a quarter of an inch in diameter. The center of the area may be vesicular which rupture, producing a gray, then brown, sunken, crater-like lesion. There is little scar formation on the skin after the lesion heals which might require three to four weeks, depending upon the amount of secondary infection. Often it is difficult to differentiate swine pox from other skin lesions in the pig. Usually there is no elevation of temperature. Swine pox is contagious and spreads rapidly in the drove. The virus etiological agent is possibly carried by any biting insect, but particularly the hog-louse. When the internal form of the disease occurs in young pigs, typical crater-like lesions may be found on the mucosa of the stomach.

Pox has been prevalent in this country for many years and may have resulted in deaths, notably in young pigs.

When it occurs on the udders of nursing swine, sows do not nurse well and many pigs starve.

Review of Literature

McNutt *et al.*[1] reviewed American literature and found that, up to 1928, there was little information available regarding the incidence of the disease among swine in the United States. These authors described in detail pathology and concluded that the initial lesion, with its degeneration of epithelial cells, the late infiltration with leukocytes, and the healing process, were all quite typical of pox in other animals.

Kinsley[2] stated that diagnosis of uncomplicated swine pox was dependent upon identification of the cutaneous eruption. The successive changes of the eruption were not usually as distinct as in most variolas. Swine pox of a mild type had been prevalent in the Corn Belt and adjacent areas for several years. The disease had been of such a mild type that it frequently passed unnoticed; except in a few cases where hog cholera antiserum and virus were used during the incubation stage.

Outbreaks of swine pox were numerous in many areas in 1934[3]. The spread was thought to be due to extensive shipments of feeder pigs. A serious stomatitis due to pox virus was common in suckling pigs. As a rule, when skin lesions occurred, one failed to find internal lesions. Typical pox ulcers could be identified in the absence of skin lesions. In small pigs, death losses were heavy.

John B. Nelson,[4] found that protective substances produced by vaccinia virus in swine were transmitted repeatedly to the young by way of the colostrum. In two instances, suckling immunity was demonstrable in the young of six successive farrowings which numbered 37 and 57 individuals respectively. The immunity acquired by suckling pigs began to decline during the second month and was practically negligible by the end of the third month. Vaccinia virus introduced cutaneously during the first few days of life in the passively protected pigs exerted little or no immunizing effect. The practical application of this would mean that, once pigs become immune to the disease, their offspring would also acquire a certain degree of resistance.

*Allied Laboratories, Inc.

Swine pox was frequently observed as a slight affection on the bellies of occasional pigs presented for hog cholera vaccination, according to John Bryant[5]. He observed two herds of swine with pox that were separated by a highway. Both herds were cared for by the same man. One herd of suckling pigs was extensively affected with pustules. Temperatures in this lot were recorded as high as 106 F. Forty per cent of those affected died and those that lived were slow to gain weight. There were no losses among the older animals.

Wilson[6] stated that swine pox was quite prevalent in droves in Eastern Iowa. Swine growers realized the seriousness of the condition wherever experience was had with it. It was hazardous to vaccinate by use of the simultaneous serum-virus treatment. Bad results followed vaccinations in infected droves. His experience in practice indicated that control and eradication of hog lice was the major factor in controlling and alleviating swine pox in the field.

Murray, McNutt, and Purvin[7] observed peculiar skin eruptions which they tentatively diagnosed as swine variola. The disease occurred in young swine from suckling age up to 200 lb. weight, but did not occur in aged hogs. It was observed in all seasons of the year. All pigs in a drove were not affected, although, in some, up to 80% exhibited lesions. The eruptive processes were usually along the belly and inner surfaces of the legs. No lesions were observed on the nose. Murray was able to transmit the virus of swine pox to experimental pigs by means of scarification. The period of incubation was about 15 days. Attempts to reproduce the disease in rabbits failed; indicating that rabbits were refractory to inoculation of swine pox virus.

According to Kinsley[8], a virulent outbreak of swine pox occurred in Missouri and probably in some adjoining states in 1931. It affected 50 to 80% of the swine in diseased herds. Kinsley warned that the simultaneous occurrence of swine pox and erysipelas might result in a symptom complex which might be misleading. The temperature was usually higher and depression and dullness were more marked in erysipelas than in swine pox. He stated: "Is there any wonder that swine of today are subject to a variety of diseases, when the modern hog, which, in comparison to its ancestor, has a diminished capacity of the lungs and of the digestive tube, is maintained in filth, and is force-fed to make it marketable at six or seven months of age." This statement was true 20 years ago.

What speculation could be made in 1956 as to what might happen to the swine industry during the next 20 years when advancement made in inbreeding and hybrids, to say nothing of various management changes including feeding and addition of growth stimulating factors is considered? Any prediction would likely be fantastic.

According to Flaherty[9], swine pox was an infective, contagious, and eruptive disease. The period of incubation was estimated to be about four days. Swine of all ages were susceptible; but, as a rule, young animals became infected first. Often systemic disturbances occurred. Skin lesions appeared on the face, abdomen, and inner thighs but might also extend over the entire body. The first lesion was that of pin-point reddening, then pea size and vesicular. The vesicles rupture, leaving a crater-like lesion. They often run together, forming scabs which become infected with any type of earth borne bacteria. Some times fatal pneumonia develops in small pigs.

Quinn[10], stated that suckling pigs were apt to die from swine pox and its complications. Swine affected with pox were usually covered with hog lice. He recommended that infected droves be sprayed or dipped to control the lice. These carried the virus.

Swine Pox and Variola

P. Salomkine and S. Anapov[11], reported that pigs could be vaccinated against porcine variola with virus consisting of crusts taken from swine spontaneously affected with the disease in a benign form. The virus-vaccine taken from such cases did not produce generalized variola in vaccinated animals, even after several passages. It produced only a local benign infection. The dried virus could be preserved in tubes for two or three months without losing its property of producing the benign type in vaccinated animals. In an emergency, human small pox vaccine could be employed, although 1% generalized infection resulted. It generally caused a local pustule with a rise in temperature of one or two degrees.

Practitioners were keenly anxious for information on swine pox according to John B. Bryant[12]. He believed that there must be quite a variation in the severity of pox attacks, or it might be that such attacks rendered pigs susceptible to dormant infections and that the secondary invaders were responsible both for the degree of illness in pox cases and the difficulties associated in serum-virus vaccinated

droves. Pigs which were closely confined in poorly lighted quarters appeared to suffer more severe attacks.

Shope[13], presented evidence that at least two biologically distinct viruses were involved in the disease diagnosed as swine pox. Previous experimental data had shown that human smallpox virus could be adapted to swine by lapinization (passing human virus serially through rabbits and then to swine). In the early days, practicing veterinarians questioned this idea because they had observed the absence of cross immunity between natural swine pox infection and experimental inoculations with vaccinia virus. One attack of true swine pox rendered hogs solidly resistant to reinfection but still susceptible to vaccinia virus. Serum of immune pigs rarely revealed demonstrable virus neutralizing antibodies. Shope found that swine free of lice would not transmit disease by contact, even if confined in a pen with noninfected hogs, but contact infection regularly occurred with louse-infected swine after 12 to 18 days. Lice must be mechanical carriers because the virus did not multiply or pass through a transitional stage within the louse. Vaccinia infection in swine was more rapid than that of swine pox, but lesions were similar and could not be differentiated clinically. Vaccinia lesions were superficial and persisted for only a short time as compared to swine pox. Shope was not able to reproduce the septicemic lesions which were sometimes found in natural outbreaks.

Schwarte and Biester[14], reported on a pox-like disease in swine. The virus particles passed through fine filters and proved to be infectious when inoculated into susceptible pigs. From the microscopic pathology, they concluded it was swine pox. The virus was immunologically distinct from that of vaccinia. Recovery from this disease produced immunity against subsequent infection but did not immunize against infection from vaccinia virus. The virus was host specific and could not be transmitted to other animals. Their experimental work indicated that this virus was spread by insects other than the hog louse (*Hematopinus suis*). The lesions produced by this virus appeared as round and rather smooth with no central areas of depression. The margins of the lesions were light gray, similar to those observed in some fungus infections.

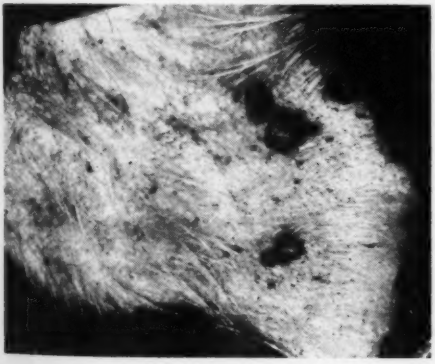

Fig. 1. Typical acute and chronic lesions of swine pox. These are easily distinguishable on nonpigmented skin. Heavy louse infection is the usual observation in field cases.

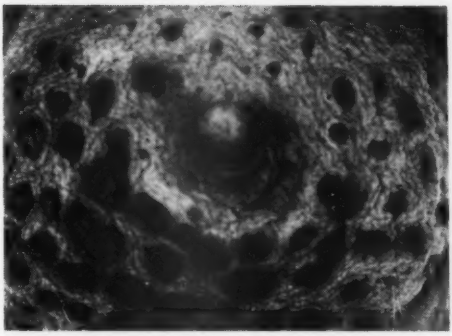

Fig. 2. Swine pox illustrating typical lesions on the mammae. After rupture, vesicles lesions become crater-like due to secondary bacterial invaders. When such lesions appear on the skin of young pigs, no internal lesions are observed at autopsy as a rule. Lesions in the stomach and intestines may be demonstrated in individual young pigs at autopsy in the absence of skin lesions.

Breed[15], stated that there were two schools of thought regarding swine pox. One group believed that swine pox was a necessary evil; that it caused some disturbance in growing swine but was not a serious problem. The second group believed that certain types of the disease caused severe losses and that at times it was a decided economic handicap in growing young swine. Perhaps both groups were right in their opinions because, as shown by Shope, the severity of the disease may depend entirely on the virulence of both types of viruses.

Creech[16], reported that swine pox was an infectious disease which was known to be caused by two types of virus. This was evidenced by the fact that swine which had recovered from the disease were immune to the particular type of virus which caused the attack, but they were still susceptible to the other type of virus to which they had not been exposed.

In 1942,[17] swine pox had increased in prevalence through many districts in the Midwest. There appeared to be at least two strains of virus; one of which was benign while the other was often virulent and severe. Pox lesions were the typical papules, vesicles, pustules and umbilicated scars of all of the pox group. Open lesions of the digestive tract were common in some small pigs. Starvation losses occurred among litters attempting to nurse sows with teat and udder lesions. The sows became restless due to the soreness of the udders and did not allow pigs to nurse. The baby pig which nursed the sow with the teat lesions acquired intestinal lesions and died of septicemia.

Vaccine Trials

In 1942, Smith *et al.*[18] reported on the use of an autogenous swine pox vaccine in an attempt to prevent the disease. The vaccine was prepared in the following manner. Scabs containing the virus were procured from an acute case of swine pox. These were harvested from a cholera-immune animal approximately six months of age. After washing the area with ether to remove fat and debris, scabs were removed with a sharp scalpel, placed in a sterile glass receptacle and immediately frozen and dehydrated. The virus was held in the dry state for four months in the ice compartment of an electric refrigerator. Sufficient virus was added to 50% buffered glycerine solution to make a 10% emulsion.

The method of vaccination was as follows: Pigs were held by the hind legs with the abdomen toward the operator. The skin in the fold of the flank was cleaned with ether only. After allowing time for evaporation, an area about one fourth inch square was scarified by means of a dulled hypodermic needle. Scratches were made only in the superficial layer of the skin, not deep enough to draw blood. At no time during the procedure did the scarified area bleed. Vaccine was then applied with a small stiff brush and the pig released. Five days later pigs were examined for "takes". Only slight redness appeared. On the tenth postvaccinational day pigs were again examined for "takes". At this time, a blister was beginning to form. On the third examination, which was on the 15th postvaccinational day, the takes were well formed and similar to those observed in small pox vaccination of man.

The following is the result of the experiment:

Total pigs in group	64
Number vaccinated	35
Number of takes	34
Number of controls	29
Takes contracted pox	4 = 12%
Controls contracted pox	11 = 38%

R. M. Hofferd[19], recommended the use of sulphurized oil to rid the swine of the hog louse. Coal tar dips were unsafe to use due to excessive absorption through the broken skin and consequent toxicity. The disease usually ran its course in from four to six weeks or longer in large droves.

Smith[20] experienced a high mortality in small pigs vaccinated during an outbreak of pox in a drove in Oklahoma. Exceptionally high virulent outbreaks occurred in which the mortality ran as high as 50%. In such attacks during extremely warm weather and when the pigs were heavily infested with lice, eruptions extended over the entire body. In order to control lice, animals were sprayed with 1% DDT. Spraying was repeated in approximately three weeks.

An unusual observation was made in a herd of 115 five-month-old cholera immune pigs by W. A. Aitken[21]. Several were off feed and acted queerly. Ears were swollen and apparently sensitive; some kept away from the herd and frequently shook their heads gently. Examination revealed pox-like lesions which appeared on the inside and outside of the ears, on the back of the neck to the loins. The herd was sprayed with sulphurized oil and, within a few days, all symptoms disappeared. He concluded that the greatest hazard from swine pox appeared to be that it occasionally may be the factor which lowers resistance to secondary bacterial invaders which may cause septicemia and death. He cited two herds of swine affected with pox in which *Salmonella suipestifer* was the secondary invading organism. Losses occurred in both herds.

A veterinarian from Virginia asked a question regarding a condition in pigs[22]: "For the past several months, the following condition has been brought to my attention, usually affecting pigs. Small nodules appear around the ears and some also occur on the thighs and on the belly. Lesions occur on all breeds and are not restricted to the white areas of the skin. Nodules redden and rupture and later a scab forms. Scabs come off easily leaving a raw surface. Several lesions may become confluent in the axilla and form large wart-like, bleeding masses. Nodules and wrinkling of the skin are most pronounced.

Affected pigs do not appear to be in pain and are in good condition at the onset, but the skin soon wrinkles and the folds appear leather-like. Often the eyelids are involved and conjunctivitis occurs. Pigs eat normally. Temperatures may be 104 F. Pigs soon cease to thrive. I would appreciate suggestions as to etiology and treatment." J. C. Carey, a practitioner of West Liberty, Iowa, gave the following answer which illustrates the thinking of many veterinarians: "I believe the condition that you describe is swine pox, the causative agent of which is a virus. The first step in treatment is to eliminate the hog lice. If just a few pigs are affected, separate them from the others to prevent spread by contact. Pruritus may be relieved by applying mineral oil to which four ounces of pine oil per gallon is added. If pigs are on a well balanced ration, lesions finally heal, although I have seen fatal cases, especially where eyelids and the conjunctiva are involved. Swine pox is more serious in the winter months. It is best not to double treat affected pigs as the cholera virus, with swine pox virus, may be more than the pigs will tolerate."

Atypical Pox

The condition that A. Hjarre[23] described as contagious pyoderma might be a form of swine pox. This was described as due to staphylococci and streptococci. It affected young pigs during the warm season and was spread by lice. Lesions were transient, vesicular and pustular, followed by formation of crusts. Usual location was on the head, especially around the eyes and the outer side of the ears, and the lateral surface of the body. In most cases lesions healed with scars.

Williamson[24] described an acute or bloody form of pox. External lesions were found usually in the hairy portions of the body, the eyelids, the internal and external surfaces of the ear, sides of the neck, ventral to the anus, and converging down each hind limb. The writer must admit that we have never observed this type of pox.

Summary

Attempted immunization for hog cholera becomes a problem if animals are suffering from pox. In such affected herds, the dose of antiserum should, in all cases, be doubled that recommended.

Any biting insect may be a disseminator of virus.

Swine pox may be confused with other diseases in which there are skin lesions, such as mange, erysipelas, hog cholera, parakeratosis, and eczema of baby pigs. There is a possibility that it might also be confused with a virus dermatitis.

Future progress with swine pox virus should be directed toward growing the virus on chick embryos and in tissue culture media, so that a suitable vaccine can be prepared for prophylaxis.

At present, immunization is not practiced because suitable vaccines are not available.

The eradication of hog lice would do a great deal to control the disease.

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The Isolation Of *Listeria monocytogenes* From The Liver Of Calves And A Discussion Of Intrauterine Infection†

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LISTERIOSIS generally is regarded as a bacterial infection of the central nervous system of sheep, cows, and goats. However, a septicemic form is reported commonly among rodents, fowls, pigs, horses, and man[1-3]. A similar septicemia also has been reported in lambs[4,5] and calves[6-8] before the rumen is functional. It is the purpose of this report to present the isolation of *Listeria monocytogenes* from the liver of six calves which died within the first 19 postnatal days. These deaths occurred over a period of 18 months.

Clinical Findings

The six calves were in the same barn at the time death occurred, but two were born in other herds. All died between two and 19 days after birth. These calves were to be used for nutritional studies and some were on synthetic diets. In general, the antemortem symptoms and the lesions at necropsy followed a similar pattern. At the onset there were anorexia, muscular weakness, rapid respiration, progressive loss of weight, and marked depression. A temperature of 105 F. was found in one animal. These symptoms persisted for two to four days. There were no symptoms suggestive of nervous system damage. One calf began to scour on the seventh postpartum day. This persisted until death, 12 days later. Another calf passed what appeared to be pure blood 24 hours before death. Scouring was absent in the remaining four calves. At necropsy the predominant lesions were confined to the liver and upper intestinal tract. In all but two instances the liver revealed rather indistinct areas of focal necrosis which ranged from pinpoint to 2 mm. in diameter. One liver revealed only a marked yellow color and one appeared normal. Marked congestion and hemorrhages, up to 7 cm. in diameter, were found in the mucosa of the stomach and/or small intestine of four calves. The contents of these organs usually were dark in color and contained blood. In some, the mesenteric lymph nodes were congested and enlarged. Less consistent alterations were cysts on the tricuspid valve, thrombi on heart valves, serosanguineous fluid in the pericardium, peritonitis, splenomegaly, caseous material in the crypts of the colon, and milky or greyish granular material in the calyces of the kidneys.

Cultures prepared on Difco tryptose agar by smearing the agar surface heavily with a rather large block of liver tisue (1-2 cm.)' yielded from one to many small, round, slightly raised colonies after 24 hours incubation at 37 C. Examination of the plate with a scanning microscope and obliquely transmitted light revealed blue-green, finely textured colonies suggestive of *L. monocytogenes*[9]. Gram's stain revealed short, rather plump, blue rods, often in palisade arrangement. Identification was confirmed by appropriate biochemical and fermentation reactions and rabbit inoculation. Similarly prepared cultures from the spleen, kidney, heart blood, and intestinal tract failed to yield significant bacterial growth. Unfortunately, the brain of none of these calves was cultured.

Two other calves showed similar symptoms and lesions at necropsy but the viscera were not cultured. The vagina and cervix of the dam of each calf were cultured for several days following parturition but *L. monocytogenes* never was isolated. The dams failed to

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show any pre- or postpartum symptoms of illness.

Direct smears of the stomach and intestinal contents from the calves which showed gastritis and/or enteritis, when stained with Gram's stain revealed many erythrocytes, a few leukocytes and large numbers of Gram positive rods in palisade groups resembling *L. monocytogenes*. Nevertheless, these organisms were never isolated from this material.

Histopathology

The most significant lesions were confined to the liver. Alterations were of three distinct types: Degeneration of hepatic cells, discrete focal necrosis without involvement of adjacent hepatic cells, and diffuse necrosis with almost complete obliteration of the hepatic cells. The first type was seen only in the liver of a two-day-old calf. Lesions were limited to a few small areas in which the hepatic cells showed pyknosis, karyorrhexis and, occasionally, karyolysis. Some cells took an intense eosin stain, but there was no evidence of leucocytic infiltration. All other livers examined revealed varying degrees of necrosis which ranged from discrete areas of focal necrosis, with little or no involvement of the adjacent hepatic parenchyma (fig. 1), to almost complete destruction of the hepatic cords (fig. 2). The discrete foci of necrosis (fig. 1) were accompanied by a predominantly lymphocytic infiltration and often appeared to be associated with arterial thrombosis. These thrombi ranged from very small to such as would almost completely occlude the arterial lumen. In some instances, there was extensive degeneration of the endothelial lining. Occasionally proliferation of fibroblasts was observed. Gram positive rod-shaped bacteria were found distributed throughout these necrotic areas but were most numerous at the periphery of the lesion. Livers in which destruction was almost complete were characterized by extensive fatty metamorphosis and necrosis of parenchyma (fig. 2). The remaining liver cells stained deeply with eosin contained very small fat droplets or large vacuoles with complete atrophy of the hepatic cords. The necrotic foci also revealed polymorphonuclear leucocytic infiltration, proliferation of endothelial cells, epithelioid cells, and a few lymphocytes. There were also several large areas of hemorrhagic and fibrinous exudation. Only one liver exhibited both focal and diffuse types of lesions.

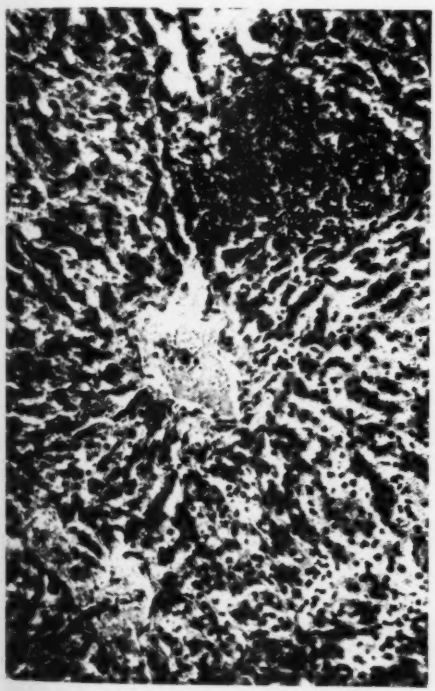


Fig. 1. Discrete focal necrosis with predominantly lymphocytic infiltration showing close association with artery. Adjacent hepatic cords only slightly involved. H & E stain. 145X.

Only a limited number of sections of other organs was available and no marked changes were observed except in the stomach and intestine of the calves which displayed marked congestion or hemorrhages in these organs at necropsy. These indicated marked hemorrhago-necrotic enteritis and gastritis. All visible blood vessels were engorged with blood and many contained thrombi. There was extensive infiltration of both neutrophiles and lymphocytes into the lamina propria. The epithelial lining of the intestinal lumen was necrotic and exfoliated.

Discussion

The isolation of *L. monocytogenes* from the livers of six young calves was of interest from both the epizootiologic and pathologic aspects. These calves either were on or were to be put on experimental calf rations. They all received colostrum and were starved for 24 hours prior to being placed on experiment. Some deaths occurred before, one during, and some after this starvation period. Although some of these rations were of such nature that they might be responsible for the gastroenteritis seen in four of the calves, the fact

that some deaths occurred before introduction of the ration strongly suggested that death was due to infection with *L. monocytogenes*. Early death of young due to infection with *L. monocytogenes* has been reported in foals[10,11], pigs[12-15], lambs[4,5], and calves[6-9]. During the past few years a similar condition (granulomatosis infantiseptica) in the human population of both sectors of Germany has been reported by a number of investigators[16-18]. In all these reports[6-9,10-15] the predominant macroscopic lesion was focal hepatic necrosis in varying degree. In some instances, necrotic foci were observed in the spleen, lungs, adrenals, and other organs. A few authors recorded the presence of gastritis and/or enteritis.

Microscopically the hepatic lesions were of three distinct types and ranged from acute to a more chronic form. In some instances, the severity of the lesion could be related to the age of the calf, but this was not always true. The least severe lesions were seen in the liver of a two-day-old calf while the most severe were seen in a 12-day-old calf. The only one to survive 19 days exhibited a more chronic type of focal necrosis accompanied by lymphocytic infiltration. In general, the lesions were similar or identical to those reported by the other authors[6-9,10-18].

The lesions on the heart valves and the presence of serosanguineous fluid in the pericardium were of interest. In retrospect it is regrettable that sections were not taken or cultures prepared from these lesions. Recently *L. monocytogenes* was isolated in one instance from similar thrombotic lesions in a week-old lamb. This lamb was from a flock of 60. It was the 12th to die suddenly over a three-day period and the only one submitted for necropsy. The liver and spleen appeared normal and were negative on primary culture. They were not macerated and refrigerated[9]. Nevertheless, these findings strongly suggest that *L. monocytogenes* may be a cause of heart lesions in the very young. Neither of the two calves in the present study with lesions in the endocardium revealed marked hepatic lesions and it is possible that death actually was due to impaired cardiac function. It is well established that in fowls the most conspicious lesions resulting from listeric infection are found in the myocardium[1-3].

Although the mode of infection could not be established definitely it appeared likely that the calves were infected prenatally. Recent studies by Gray *et al.*[19,20] demonstrated that pregnant rabbits exposed to *L. monocyto-*

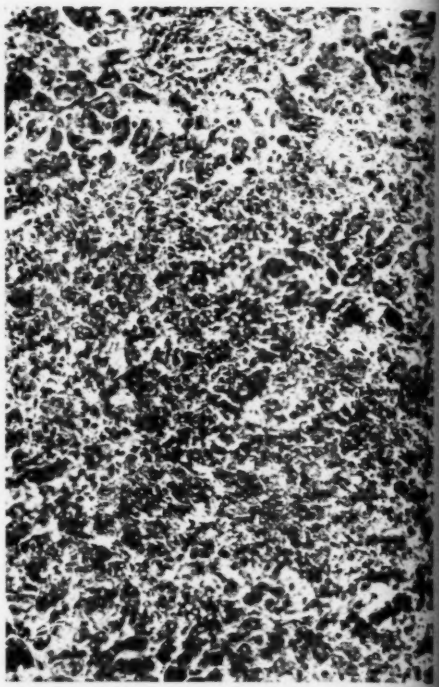
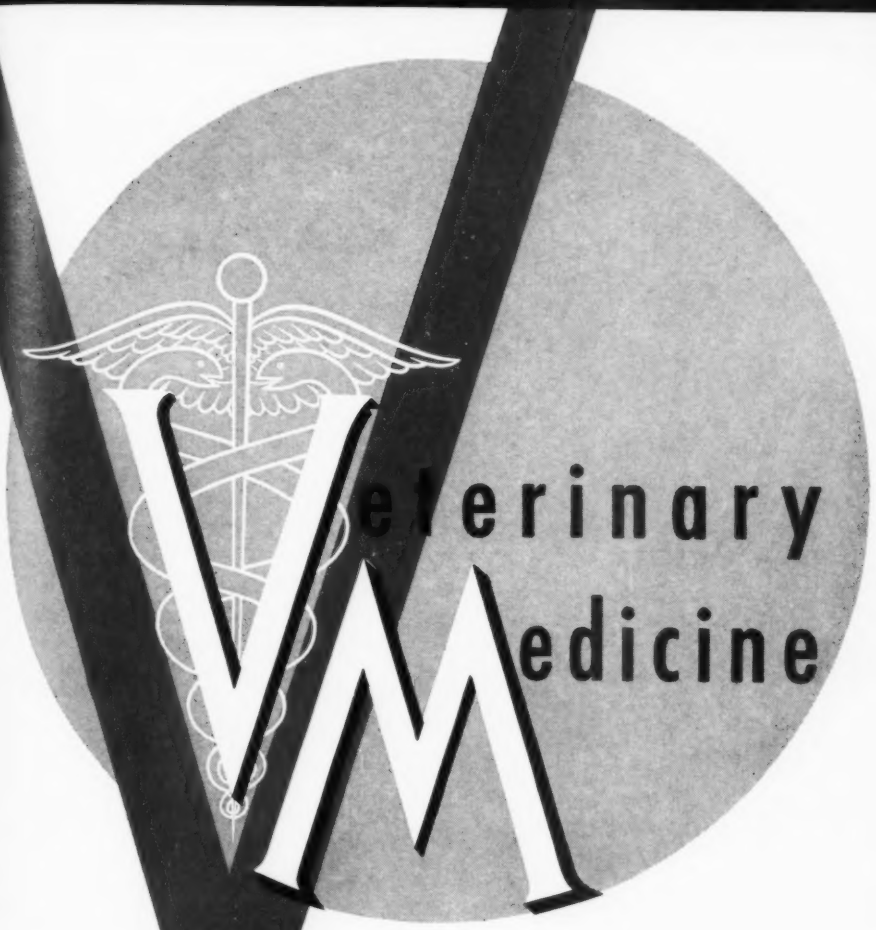


Fig. 2. Extensive parenchymatous degeneration and necrosis with complete obliteration of the hepatic cords. H & E stain. 145X.

genes by either ocular instillation or by the addition of the specific bacterium to the drinking water aborted if exposure was early in gestation. If exposure was from five days to 30 hours prepartum, the young were infected fatally. Of 115 young born at term, only one survived longer than eight days. Similar studies in sheep and goats[21] revealed that abortion, stillbirth, and early death of young could be produced by the addition of *L. monocytogenes* to the drinking water of the dam. However, a cow in the fifth month of gestation exposed in this manner for a period of two weeks displayed no ill effects. These results indicated, nevertheless, that exposure by the oral route in both monogastric and ruminant animals could result in prenatal infection of the young. In most instances, the dams exhibited no marked evidence of infection providing the entire conceptus was expelled quickly and completely. Dams which retained infected material usually died with listeric septicemia. Spontaneous listeric abortion during the third week of gestation occurred in two does rebred five days postpartum, suggesting that *L. monocytogenes* may be retained in the female repro-

(Continued on page 335)



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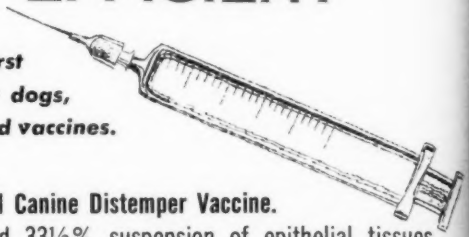

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Newer Advances In Corticoid Therapy

J. C. SIEGRIST, D.V.M., Bloomfield, New Jersey

ONE hundred years have passed since Addison first described adrenal insufficiency in man. However, the fact that adrenal extracts are active in maintaining life in adrenalectomized animals was demonstrated only about 25 years ago[1, 2].

The early work of Hench and coworkers[3, 4] from 1923 until 1949 on rheumatoid arthritis in man revealed that the processes of this disease are reversible and that the circumstances causing this reversibility, such as pregnancy, jaundice, foreign protein reactions, starvation, surgical operations, and other stresses are so variable that alleviation of symptoms could best be explained by some common denominator, probably a hormone elaborated by the body. In the latter part of this period, other investigators began to define the metabolic actions of the adrenal cortex and their observations established the point that in normal animals the secretory activity of the gland is increased in a wide variety of conditions of stress which Hench and his colleagues had learned to associated with the relief of rheumatoid arthritis.

However, the first demonstration of the physiological activity of a crystalline product of the adrenal was not made until 1936[5]. In that year, Kendall and coworkers showed that 11 dehydro-17 hydroxycorticosterone or compound E (later named cortisone) could restore vigor and endurance in working muscles of the adrenalectomized rat.

Synthesis of Cortisone

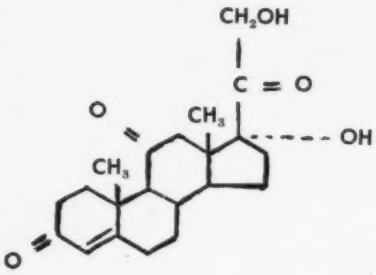
The first partial synthesis of cortisone from ox bile was reported in 1946 by Sarett[6]; and by 1948, a practical commercial process had been achieved. Thus, by utilizing the discovies and scientific advances of a century, the synthesis and production of cortisone and its related hormones were achieved, and another therapeutic agent was added to the armamentarium of the clinician. With the availability of cortisone in quantities, the range and depth of fundamental studies of adrenocorticoid function were greatly expanded.

To date some 28 crystalline steroids have been isolated from the adrenal cortex. Of these, only six have shown biological activity, and only two are clinically active as anti-inflammatory or antiallergy agents. These two clinically active agents are cortisone and hydrocortisone which are active both as free alcohols and as their various esters.

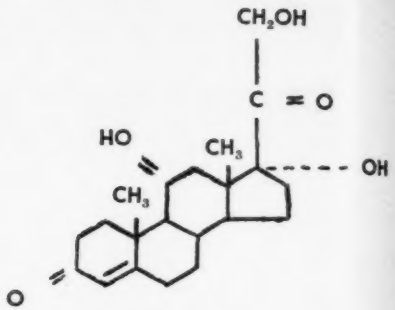
Therapeutics

Therapy with cortisone in human medicine, with its resultant successes, prompted its use in the veterinary field. In 1950, Shaw[7], working under the assumption that ketosis in cattle was due, in part, to a pituitary-adrenal insufficiency, demonstrated that cortisone was of value in the treatment of bovine ketosis. As cortisone became accepted by the veterinary profession, indications for its use gradually broadened. It soon became evident that not only could response to bovine ketosis be expected, but that here we had an agent which is effective in the treatment of arthritis in dogs, horses, and cattle, and in inflammatory eye conditions of many species including the dog.

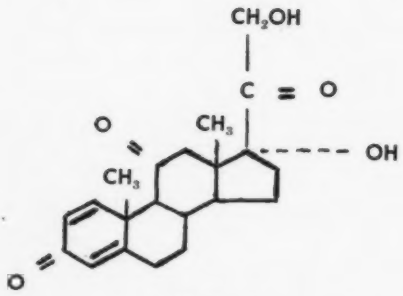
With the availability of hydrocortisone an-



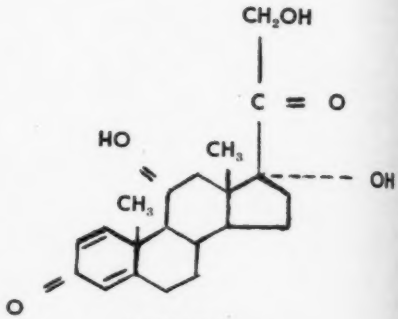
Cortisone



Hydrocortisone



Meticorten



Meticortelone

other stride forward was made in the field of cortico-steroid therapy. Indications for the use of hydrocortisone were similar to those of cortisone, but new routes of administration were opened. Cortisone is active orally, intramuscularly, and by topical application to mucous surfaces. Hydrocortisone is active by these routes, and in addition has been shown to be active by intra-articular injection, and by topical application to the skin.

Besides their use in ketosis, arthritis, and certain eye conditions, cortisone and hydrocortisone have been used with success in other conditions including various allergies such as urticaria, atopic dermatitis, and bronchial asthma, as well as otitis externa, heat stroke, shock and acute fulminating infections.

Early in 1955, two new synthetic products which are structurally similar to cortisone and hydrocortisone but which have not been found in adrenal extracts were introduced to the medical profession[a]. These are the two newest steroids, prednisone (meticorten)® and prednisolone (meticortelone)®. These latter two compounds have greater activity than either cortisone or hydrocortisone and are apparently useful in a wider variety of clinical conditions. In addition, the side effects noted with cortisone and hydrocortisone are not seen to any great extent with meticorten and meticortelone.

Indications

The two new METI compounds are effective in the treatment of all conditions which respond to the older corticosteroids. Both agents have a potency of from three to five times that of cortisone or hydrocortisone on a milligram for milligram basis. Thus, these two newer corticosteroids can be used at considerably lower doses than either cortisone or hydrocortisone. Conditions which respond to meticorten seem to respond equally well to meticortelone in the same dosage range. The possibility that there may be more advantageous routes of administration with these two newest members of the corticoid series does exist and this is at present under investigation. Besides their advantage of potency, they do not show the adverse side effects such as salt retention and potassium depletion seen with

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prolonged administration of the older steroids. From clinical work it would appear that the indications for use of meticorten are much broader than those of cortisone or hydrocortisone. For instance, excellent responses have been noted in the treatment of summer eczemas and other dermatological conditions in the dog and cat especially in those cases which have shown little or no response to other therapy over a period of years. In these cases, it has been the practice of clinicians to administer meticorten by injection in 30 to 50 mg. doses every other week for three or four treatments, or to start with an initial injection of 20 to 25 mg. followed by 10 mg. daily in divided doses for three to four days. This dose has then been reduced to 5 mg. daily for another three to four days and then medication is discontinued or the animal is maintained on from 1.25 to 2.5 mg. daily.

In some cases it has been necessary to carry animals at a maintenance dose level of 5 mg. daily. In practically every instance reported, the intense pruritus which accompanies this condition has been brought under control in less than 24 hours and even in the most severe cases, lesions are practically normal in appearance in seven days or less. Recently, Koger[9] published an excellent clinical paper on the response of difficult skin conditions to meticorten.

In spondylitis and other true arthritis conditions, the anti-inflammatory effects are readily noted. With the administration of the drug, heat, pain, redness and swelling of the affected joint or joints diminish. Greater flexibility and movement results and animals treated show a marked change in attitude and personality. Cases in our files are numerous. One example of the response of arthritis to meticorten is as follows:

A Collie, male 12 years of age, was extremely lame in both rear limbs. This condition had existed for several months and was becoming progressively worse. Both coxofemoral joints, and both stifle joints were swollen and extremely sensitive to touch. The animal showed no inclination to stand or walk, and exercise was extremely limited. Food was refused. A diagnosis of arthritis was made. Fifty milligrams of meticorten aqueous suspension were given intramuscularly every other day for three injections. Five milligram tablets were dispensed to be given twice daily. At the end of the series of injections, the animal was considerably improved in both ability to move and exercise, and in appetite. Continued improvement has been noted.

Laminitis or feed founder in horses and cattle has shown good response to the new synthetic hormone. This is particularly true in beef cattle being conditioned for fat stock show purposes, and in dairy and beef cattle being fitted for sale. In many instances a single injection of from 100 to 200 mg. will effect recovery. Occasionally a second injection is necessary. It has also been used systemically in a number of horses with ocular

TABLE 1. Response of Cattle with Ketotic Symptoms to 100 Mg. Meticorten

Case No.	Day 0		24 hr.		48 hr.		72 hr.	
	Glucose	Acetone	Glucose	Acetone	Glucose	Acetone	Glucose	Acetone
	mg./%	mg./%	mg./%	mg./%	mg./%	mg./%	mg./%	mg./%
1	31.6	12.2	49.2	9.8	—	—	43.4	2.3
2	19.3	27.4	41.2	17.6	44.5	6.3	—	—
3	29.6	14.5	24.2	16.5	21.3	19.8	—	— **
4	33.0	10.4	51.6	7.1	—	—	—	—
5	27.2	22.5	—	—	46.2	4.4	—	—
6	32.5	8.9	54.7	3.1	—	—	44.1	2.3
7	35.2	17.3	60.7	10.6	—	—	43.6	4.3
8	32.1	11.3	53.6	8.4	41.4	3.6	—	—
9	19.6	21.2	39.	11.5	43.2	2.7	—	—
10	24.7	16.5	49.9	6.1	48.7	4.3	—	—
11	26.7	13.7	43.2	2.5	42.2	2.4	—	—
12	33.16	11.74	—	—	43.62	2.58	—	—
13	14.40	16.51	21.53	18.06‡	48.13	6.25	—	—
14	36.71	17.22	—	—	41.67	2.39	—	—
15	22.51	8.62	19.11	17.43‡‡	56.18	4.33	—	—
16	14.96	20.03	31.25	16.63†	41.74	8.36	—	—
17	19.43	14.49	39.64	8.93	44.25	3.65	—	—
18	28.65	11.76	—	—	—	—	45.62*	1.95*
19	30.80	12.80	42.86	5.22	—	—	—	—

*Eight days later
**Uterine discharge—treated with antibiotics plus meticorten (400 mg.)—Recovered
‡Retreated at 24 hours—(200 mg.)
†Retreated at 24 hours—(100 mg.)
‡‡Retreated at 24 hours—(200 mg.)
Chart figures from Robertson, W. G. and Bailey, W. W.

conditions especially in corneal ulcers and conjunctival and scleral inflammations.

According to Morris and Hall[10], results in cattle have been excellent in the treatment of ketosis. Clinical reports in our files show that of the first 300 cases treated, over 81% recovered with only one injection. These included cases of both primary uncomplicated, and secondary ketosis. The dosage range varied from 100 to 500 mg. per individual, with by far the largest number treated falling in the 150 to 250 mg. per treatment range. In a recent article by Shaw[11] the author states that doses higher than 500 mg. do not increase the chances of recovery from ketosis. This seems to be true; in fact, results indicate that in the majority of cases 200 mg. is the effective dose and that doses in excess of 200 mg. are unnecessary. Preliminary reports on work by Robertson[12] at the Sussex, New Jersey, Research Station in cooperation with veterinarians in the dairy area of northern New Jersey seem to indicate that in early, primary ketosis, 100 mg. are sufficient to effect recovery (table 1).

As can be seen from table 1, of the first 19 cases treated in this area, 15 recovered with a single 100 mg. injection. Of the four cases which did not respond, one was a case which was complicated by a retained placenta. By instituting appropriate antibiotic therapy in this particular case, together with repeat treatment, recovery was effected. This case serves to emphasize the following statement by Fincher[13] in the November, 1955 issue of VETERINARY MEDICINE: "Undoubtedly, time will prove that cortisone and adrenocorticotropic hormones (ACTH) in their various forms are almost sufficiently specific in acetonemia and in septic conditions to warrant more general use. The incurable case of mastitis, metritis, and ketosis may be put in the curable group if repeated use of this group of hormones is combined with the other well-known treatments." This last is most important, for in infectious conditions proper chemotherapeutic or antibiotic therapy must be used to eliminate the primary condition. The use of adrenocortical hormones for supportive treatment to aid in relieving stress and to help return the endocrine system to homeostasis is then indicated.

As pointed out by Hench *et al.*[3, 4] stress causes an increase in the secretory activity of the adrenal cortex. This is demonstrated in table 2, which shows the effect of stress on the plasma content of 17 hydroxycorticosteroids. Nonpregnant milking animals within six weeks after freshening show a mean plasma 17 hydroxycorticosteroid level of 4.58 micrograms percent. The ketotic animal which is a stressed individual, shows a mean 17 hydroxycorticosteroid value almost 100% above normal, while animals under other various acute stresses such as acute mastitis, metritis, traumatic gastritis, listeriosis, et cetera have mean plasma 17 hydroxycorticosteroid level of 11.95 micrograms percent which is almost 200% above normal mean values (table 2).

TABLE 2. Plasma 17 Hydroxycorticosteroid Values in Pregnant, Dry Cows; Milking Open Cows; Ketotic Cows; and Stressed Cows

Animal Group	No. Animals	Plasma 17 Hydroxycorticosteroid Mean	Range
		mcgm. %	
Pregnant, dry, within 6 weeks of parturition	23	9.77	6.90-17.62
Milking, non-pregnant, within 6 weeks post-parturition	20	4.58	2.14- 8.40
Ketotic Cows	10	7.48	2.46-10.51
Stressed Cows	21	11.95	6.58-21.78

Chart figures from Robertson, Lennon, Bailey and Mixner.

Stress

In conditions of extreme stress such as heat stroke, trauma, toxic reactions, acute infections, and during long surgical procedures, meticorten has been used as supportive treatment with excellent results. Normally in increased stress, the body requires, and the adrenal cortices, under the corticotropic stimulation of the anterior pituitary, produce increased amounts of adrenocortical steroids. If the stressing condition continues long enough, the adrenals become overworked and are not capable of producing corticosteroids in sufficient quantities to properly maintain the individual. In due time, if the stressing agent is not eliminated or replacement therapy is not instituted, hypertrophy and hyperplasis of the gland may develop. The cholesterol and ascorbic acid content of the cortex which are thought to be the precursors of the cortical hormones fails and death may ensue. When traumatic or hemorrhagic shock is the stressing agent, vascular collapse is evidenced due in part to a decrease in cortical hormones which has caused an increase in the permeability of the capillary bed. Cortical hormones as replacement therapy are of value here, and in

this condition, meticorten has been used successfully.

Reports on the use of the METI products in other conditions have been striking. Response has been excellent to all conditions where adrenocorticosteroids are indicated. According to Chambers[14], in the treatment of summer eczema, allergic dermatitis, acanthosis nigricans, ketosis, stresses, arthritis and various eye conditions, meticorten is proving an excellent therapeutic agent. In addition, our clinical evidence indicates that it will be equally effective in the treatment of posterior paresis, acute orchitis, prostatitis, lymphadenitis, debility in the aged animal, and pre- and postoperatively in poor surgical risks.

In closing perhaps it would be wise to interject a note of caution. These two products are extremely valuable therapeutic agents if handled correctly. They are extremely potent in their activity and are useful as supportive treatment in many conditions. However, in cases where systemic infections are present, proper antibiotic or chemotherapeutic agents must be used. Several cases of polydipsia and polyuria have been reported. In these instances, doses considerably in excess of those recommended in the literature have been used. By using recommended levels or by adjusting doses up or down as the need arises, much can be accomplished with them.

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▾ ▾ ▾

Feline Nutrition Studies to be Continued

The continuance of a two-year-old study of the basic nutritional requirements of the cat at the Rutgers University Bureau of Biological Research has been made possible by a third grant of $6,000. from the Mark L. Morris Animal Memorial Foundation of Topeka, Kansas.

Sanford A. Miller, a teaching assistant in physiology and biochemistry, is now handling the project which was begun by Dr. James B. Allison, director of the Bureau of Biological Research, and Dr. John R. McCoy, associate research specialist in the Bureau.

In seeking to develop a basal ration for the feline that can be used for an all purpose diet and as a control for the evaluation of special dietary needs, the Rutgers scientists have found that their semi-synthetic diet required certain modifications. The test cats did not fare well unless the diet contained approximately 25% protein and the animal was kept in positive balance.

Dr. Allison, in his recent progress report to the Morris Foundation, said that it is possible the cat "is kept in good health by a positive balance throughout adult life and mere maintenance of nitrogen equilibrium may produce depletion of some tissues in the ebb and flow which characterizes such a dynamic state. It would appear, then that the protein and B vitamin complex requirements are relatively high in the cat, a result which is consistent with the high caloric demands."

▾ ▾ ▾

The skin is the most frequent site of tumors in the dog; the mammary gland and testes follow in frequency in the order given. These conclusions are the result of study of a sizable group of specimens.—*J. A. S. Millar, D.V.M.*

Intramedullary Fixation Of Long Bones By Heterogeneous Bone Pins

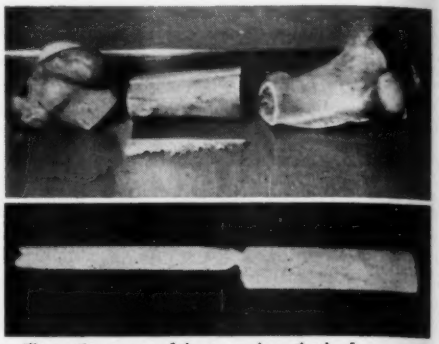
MUSTAFA TEMIZER,* D.V.M., Ph.D., Ankara, Turkey

NO attempt will be made in this brief discussion to define or classify fractures suffered by various animal species. Reference to various technics for reduction and fixation will also be deleted except to state that all have definite and well-known advantage and some serious disadvantages. The writer has been working with bone pins for fracture fixation since 1952. Successful termination in 29 of 35 cases has been reported in Turkish literature. Six cases died from other causes and these have not been considered in the tabulations of results.

Selection of Bone Pin

Pins for fracture fixation have been prepared from both living and lifeless things since the 18th century. For example: Some woods, elephant tusks, large animal bones and tendons, and metals (nails, pins, and screws) have been employed by many surgeons all over the World. Universally favorable results unfortunately have not been obtained. Recently, wider use has been made of inert materials as knowledge of asepsis and aseptic surgical technics have been made known.

Live bone transplants in fracture work is much in demand in human surgery at the present time. There have been reports of such transplantation in veterinary surgery. Both homogeneous and heterogeneous live or dead bone tissue has been employed. Unfavorable sequella in some of these trials is attributed to allergens (antigens) which may be responsible for hypersensitivity or true anaphylaxis. Methods for the treatment of fresh homogeneous bone tissue for removal of these substances believed to be antigenic is the most recent suggestion relating to the use of fresh bone for transplants.

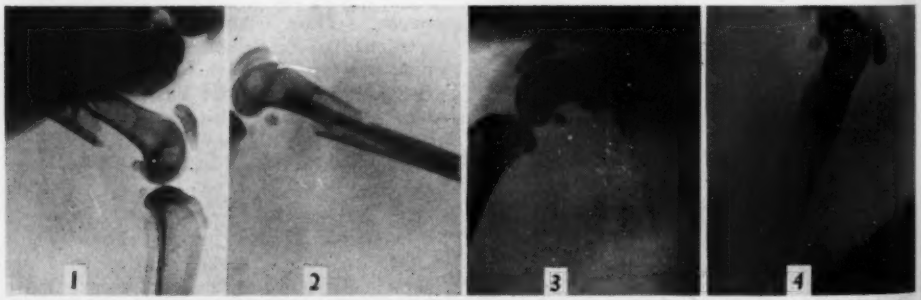


Illustrating type of bone and method of preparation of pin.

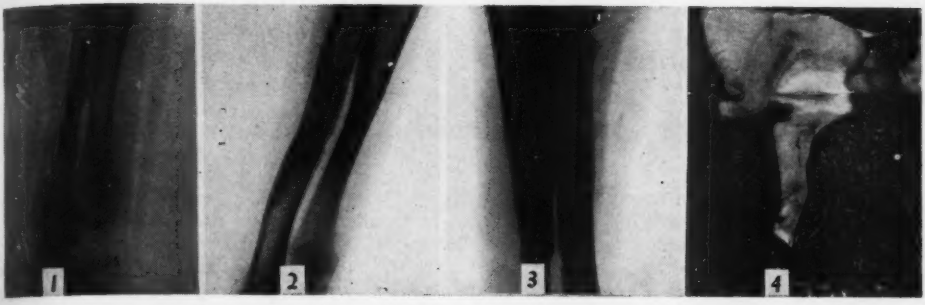
The writer has employed pins prepared from the shaft of dried long bones of horses successfully at the Faculty Hospital in Turkey. These pins have been inserted into the medullary canals of seven sheep, 12 dogs, 20 cats, and two chickens. Except for six cases (previously noted) the remainder have recovered satisfactorily.

Pins must be prepared from selected bone.

*Visitor-observer in the United States for a limited period. Doctor Temizer's address while in this country is Room 207, Agricultural Hall, University of Nebraska, Lincoln.



Case A. Fracture distal third left femur of a cat. (1) X-ray of fracture preoperative; (2) immediately following Surgery; (3) 15 days postoperative; (4) 45 days postoperative, illustrating partial absorpton of bone pin.



Case B. Transverse fracture radius midshaft. (1) Radiograms; immediately after surgery (note notch in pin); (2) 45 days postoperative; (3) 75 days postoperative. (4) Patient after wound healing.

Fresh bone, containing organic material is unsuitable. Very old bone is brittle, and thus difficult to shape and resistance of the pin is lessened. Bone should be chosen which is not too fresh nor yet too old.

The pin is prepared from the cortex of the shaft of a long bone (femur or tibia). Pin may be fashioned for an individual case or a number of various sizes may be prepared so as to have at hand size to fit the medullary canal, which may be determined, quite accurately, from radiographs. Diameter of bone pins may vary from one end to another or be roughly cylindrical. Length may be easily adjusted for particular cases and types of fractures. A notch is cut into one end to assist in inserting. After preparation, the bone pin may be sterilized by autoclaving or boiling as desired.

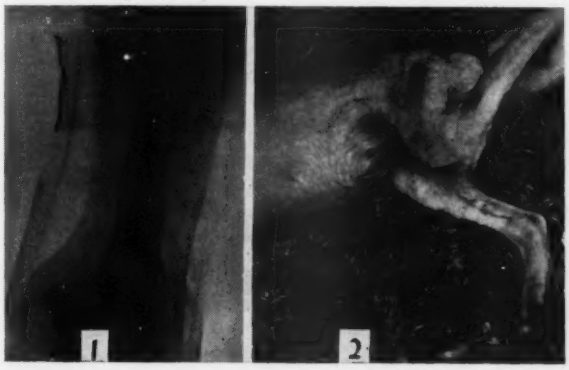
Surgical Technic

Bone pins are inserted at the fracture site by the open reduction technic. Asepsis must be adequate. Suture, either catgut or silk, is applied through the pin notch in such fashion that the notched end may be inserted first to the full length, or approximate, and retracted across the fracture site into the opposing medullary canal by traction on the suture. Ligatures are then withdrawn. Wound closure is performed as outlined for open reduction, and if deemed desirable, a suitable external splint may be applied. Plaster casts, modified Thomas splint, or yucca board may be used. Such splintage is not necessary in all cases.

In my experience, a firm callus forms promptly and satisfactory healing ensues. (See Cases A, B, C). The pin is entirely resorbed in from 45 to 70 days so that it can not be visualized by *x*-ray or isolated on autopsy. Healing time may vary on the location and nature of the fracture in consideration of the age and general condition of the patient.

Summary

A total of 35 cases of skeletal fracture in domestic animals have been reduced by open reduction and the insertion of a bone pin prepared from cured heterogeneous bone. Results in 29 cases were satisfactory. Healing was prompt, callus formation adequate and final results excellent. After complete healing, fractures were detected with difficulty. The technic may well be extended in veterinary medicine utilizing any properly prepared bone, regardless of species, for pinning any other species.



Case C. Transverse fracture distal third of the tibia. (1) Note supporting bandaging. (2) Patient after wound healing.

Serpentine Tumors†

JAMES R. WADSWORTH,* D.V.M., M.S., Burlington, Vermont

UNLIKE neoplasia in mammals and birds, reptilian tumors have been considered exceedingly rare[1]. Indeed, few malignant neoplasms of reptiles had been described until nearly a half century ago. Occasional tumors of snakes have been reported in the literature. The classical studies of Schlumberger and Lucké[2] reveal the high incidence and variety of neoplastic diseases in cold-blooded vertebrates, especially fish and amphibians. These authors feel that the incidence of tumors in reptiles would be similar to that of other vertebrates, providing careful observations could be made on a large number of specimens. According to Lucké and Schlumberger[3], all of the main types of tumors found in man and warm-blooded vertebrates have been observed in cold-blooded vertebrates. Actually, some varieties of neoplasms are more common in these animals than are the corresponding tumors in birds and mammals.

It is interesting to note that few attempts have been made to transplant tumors of snakes, and all have proved unsuccessful. Lucké and Schlumberger[4] feel that snake tissues are apparently toxic to chick embryos. They injected 80 embryos with material from a malignant melanoma in a reticulated python *(Python reticulatus)*. All of the embryos died within 48 hours. Material from an identical type of tumor in another reticulated python was injected intraocularly into seven alligators, one turtle, and eighteen frogs. None of the grafts became established and all were resorbed within four months.

During the past few years, a few additional case reports dealing with comparative oncology in captive zoo species have been published. These include neoplastic diseases of snakes. Recently Hill[5] of London described a carcinoma of the poison gland in a black and white cobra *(Naja melanoleuca)* with secondary metastases forming a chain in the cervical lymph nodes. A sarcoma of the serous surfaces in a male pine snake *(Pituophis m. melanoleucus)* was reported by Ratcliffe[6]. Also, multiple osteosarcomata were present in the spine of a Rufous-beaked snake *(Ramphiophis rostratus)* at the London Zoological Garden[7]. The largest tumor formed an irregular, hard, nodulated mass some 16 in. behind the snout. Death resulted from intestinal obstruction as well as excessive pressure from the growth. No metastases were evident. The author has published several reports of neoplasms in captive mammals, birds, and reptiles[8, 9, 10, 11, 12].

This paper presents a few cases of tumors of snakes examined by and as yet unreported by the author. It should be borne in mind that there are no significant structural differences between serpentine tumors and the corresponding neoplasms in mammals, birds, or other reptiles. Furthermore, the genesis of neoplasia is an extremely slow process. It usually consumes a major portion of the individual's life span in all species. Consequently, neoplasms are comparatively rare in early life. Table 1 lists most of those tumors of snakes which have been reported during the past half century.

In 1948, an immature Southern Pacific rattlesnake *(Crotalus viridis helleri)* arrived for exhibition at the Staten Island Zoo. It had been collected in San Diego County, California. Halloran[13] had noticed an enlargement on one side of the cloaca. Gross studies revealed it to be an elongated, spindle-shaped, pericloacal mass. Microscopic examination revealed an hemangiomatous growth. It contained cystic areas and presented considerable necrosis. Also, one portion revealed many polymorphonuclear leukocytes, indicating presumable infection. A diagnosis of cystic hemangioma was made.

Another cloacal neoplasm involved a western hog-nosed snake *(Heterodon nasicus)*. This specimen had been collected as an adult in Kansas and sent to Staten Island Zoo late in 1950. It died less than three years later. The tumor proved to be a sarcoma of unidentifiable cell type. Although the cells did not exhibit distinct fat vacuoles, a coagulated appearance of the cytoplasm was evident. This

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*Department of Animal Pathology, University of Vermont and State Agricultural College.

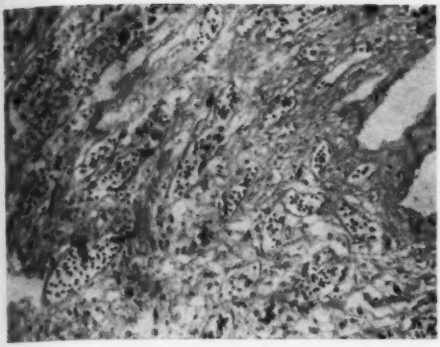

Fig. 1. Polypoid adenoma (gastric mucosa from an anaconda. (l.p.).

was thought to represent early fatty metamorphosis. Therefore the diagnosis of a possible liposarcoma was submitted.

In 1955 an anaconda *(Eunectes murinus)* was sent to Dr. T. W. M. Cameron of McGill University for necropsy. The snake had died enroute to Quebec from Florida. This specimen was 14 feet long. Death was attributed to a large bruise on its head, probably due to a blow from some blunt instrument. A portion of the gastric mucosa was sent to the author for study. It presented a pea-shaped, polypoid nodule attached to the mucosal surface. The specimen was probably not fresh at necropsy since the microsections stained poorly. Studies revealed it to be a benign adenomatous polyp. (Fig. 1).

Ball[14] submitted a tumor from a Pilot black snake *(Elapha obselota spiloides)*. The growth had been surgically removed and there was some evidence of local recurrences prior to the animal's death. It measured 2¾ in. x 1½ in., was kidney-shaped, firm, white, and fibrous. Microexamination revealed it to be

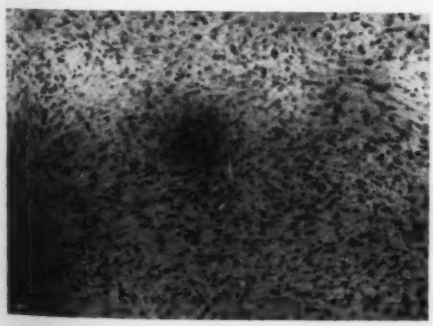

Fig. 2. Fibroma (site unknown) from a Pilot black snake. (l.p.).

TABLE 1. Neoplasms of Snakes

Snake	Tumor	Site	Author
Python	adenocarcinoma	ovary	Bland-Sutton, 1885
Python	cyst adenoma	stomach	Vaillant & Pettit, 1902.
Ring snake	adenocarcinoma	kidney	Patay, 1933.
Say's pine snake	adenocarcinoma	pancreas	Ratcliffe, 1935.
Water snake	papillary carcinoma	bile duct	Bergman, 1941.
Pine snake	melanosarcoma	skin	Ball, 1946.
Pine snake	melanosarcoma	labial folds	Ball, 1946.
	rhabdomyoma	palate	Ball, 1946.
Prairie rattlesnake	fibrosarcoma	retropharyngeal area	Ball (not published).
Coachwhip snake	adenocarcinoma	abdominal cavity	Ball (not published).
Python	melanoma	skin	Schlumberger & Lucké, 1948.
Python	melanoma	skin	Lucké & Breedis (not published).
Black and white cobra	carcinoma	poison gland	Hill, 1951.
Pine snake	sarcoma	serous membranes	Ratcliffe, 1953.
Rufous-beaked snake	osteosarcomata	spinal column	Hill, 1954.
Black cobra	osteochondrosarcoma	spinal column	Wadsworth, 1954.
Diamond-back rattlesnake	fibrosarcoma	neck	Wadsworth, 1954.
Western hognosed snake	liposarcoma(?)*	cloaca	Wadsworth, 1954.
Canebrake rattlesnake	adenocarcinoma	intestine	Wadsworth, 1956.
Southern Pacific rattlesnake	cystic hemangioma	cloaca	Wadsworth, 1956.
Australian black snake	fibrosarcoma	subcutaneous	Wadsworth, 1956.
Black rat snake	hemangioadenocarcinoma	intestine	Wadsworth, 1956.
Timber rattlesnake	adenoma	intestine	Wadsworth, 1956.
Pilot black snake	fibroma	———	Wadsworth, 1956.
Anaconda	adenomatous polyp	stomach	Wadsworth, 1956.

*Unidentifiable cell type.

a fibroma, (fig. 2). However, the size of some of the nuclei pointed to the possibility of potential malignancy.

A canebrake rattlesnake *(Crotalus h. atricaudatus)* submitted by Doctor Halloran revealed a neoplasm attached to the intestinal wall. No significant antemortem data on this specimen is available. It had been collected in South Carolina. The growth proved to be an adenocarcinoma. (Fig. 3).

In addition to the above specimens, two other tumor-bearing snakes have been examined. An Australian black snake fed on mice, frogs and fish developed a subcutaneous swelling. It was a small, firm, whitish growth. Microstudies revealed it to be definitely sarcomatous—a fibrosarcoma.

Two years ago, the Staten Island Zoo sent the author a black rat snake *(Elapha obsoleta).* A mass had been noted in the region of the gall bladder and adjacent intestine. The growth was the size of a walnut, whitish and adhered to a loop of the bowel. Microexaminations showed it to be an hemangioadenocarcinoma.

Summary

Few neoplasms of snakes have been reported within the past 50 years. However, it appears evident that neoplasia in serpents is by no means rare. These findings may contribute in some small way to the broad study of cancer in man and other warm-blooded vertebrates.

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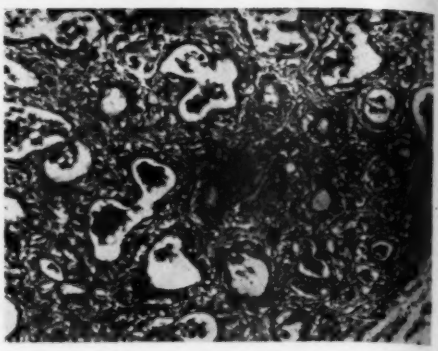

Fig. 3. Adenocarcinoma (intestinal wall) from a canebrake rattlesnake. (l.p.).

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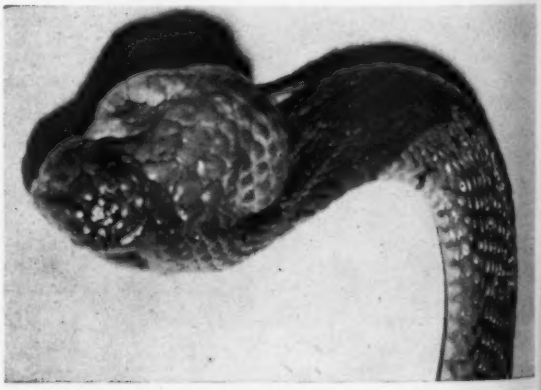

Fig. 4. Granuloma of the head and neck in an Indian cobra (Naja naja). Courtesy of Staten Island Zoo.

Infectious Enteritis and Pneumonitis in Cats

MARK STERNFELS, D.V.M.,
Mount Vernon, New York

Feline infectious enteritis, cat fever, distemper, or plague is a single viral disease of cats. It affects all cats regardless of age, sex, or breed. Peramanent immunity can be established by means of two doses of vaccine administered to healthy kittens.

Symptoms

Infectious Enteritis. The symptoms of infectious enteritis usually consist of severe, acute, and constant retching, accompanied by watery diarrhea, elevated temperature, dehydration, loss of appetite, roughened hair coat, debility, and death. Morbidity lasts from a few hours to a few days.

Pneumonitis. Equally distressing and difficult is a disease of cats referred to as pneumonitis, sinusitis, infectious rhinitis, or head catarrh. This disease is caused by a virus, is not so acute, but is highly contagious and spreads like wildfire through an entire cattery with the introduction of but a single case. Symptoms are watery eyes, reddened conjunctiva, constant sneezing, lack of appetite, beaded, watery drooling discharge from the closed mouth, roughened hair coat, but only slightly elevated temperature. Pulmonary rales or increased vesicular murmur are absent. In general, the attitude is one of an animal with a severe affectation of the upper respiratory tract. Feces are normal or scanty.

No preventive vaccine exists. Morbidity reaches 85% or more in catteries. Few deaths result if the disease is recognized early. An attack does not simulate permanent immunity. It is believed that the infective agent is carried by attendents or visitors.

Treatment for Enteritis

Treatment with homologous antiserum has had mediocre success. The writer has treated several outbreaks both in private homes and in catteries involving over 50 cases during the past year in the following manner: Affected patients are handled with care. A solution of chloromycetin®[1] is diluted so that each cc. will represent 200 mg. of the antibiotic. Initial dose is 25 mg. per lb. of body weight given intramuscularly. Treatment is repeated in 24, and if necessary again in 48 hours. Owner is instructed to give ½ tsp. of blue label karo® syrup mixed with ½ tsp. of orange juice every two hours for six doses. Milk of bismuth (1 tsp. every two hours for four doses—alternately with syrup) is also recommended.

If procurable, the juice from crushed beef liver is given with an eye dropper in ½ oz. amounts two or three times in the course of the day.

Curative effects have been good. Affected animals cease vomiting. Body temperature drops gradually, the severe craving for water ceases, and the patient goes on to complete recovery.

Treatment for Pneumonitis

Chloromycetin solution is diluted to contain 200 mg. of the antibiotic per cc. Inject intramuscularly 25 mg. per lb. of body weight on the first, second, and third day of treatment. Supportive treatment as follows is important: Polyotic®[2] eye ointment is applied twice daily. Bland nose drops of argyrol are administered also twice daily. Karo syrup and orange juice mixed together are given three times; milk of bismuth twice daily. Beef liver extract is also recommended. Liver and B complex injections are administered daily intramuscularly.

Complete recovery in two to three weeks is to be expected when treatment can be started early in the course of the disease.

[1]Parke, Davis & Co., Detroit, Mich.
[2]Lederle Laboratories Div., Pearl River, N. Y.

Differential Diagnosis

Infectious enteritis	Pneumonitis
1. High temperatures followed by sudden subnormal temperature.	1. Slightly elevated or normal temperature.
2. Onset — periacute or acute. Incubation period — 1 to 7 days.	2. Onset — gradual. Occasional sneezing, lacrimation, loss of appetite gradual. Condition can exist for almost a month before final recovery or death. Incubation period — 4 days or longer.
3. Pathognomonic — abnormal thirst, constant retching, severe diarrhea, rapid dehydration. tion.	3. Pathognomonic — severe conjunctivitis, beady, watery drooling from mouth, constant sneezing, loss of appetite, lethargy, scanty or absence of bowel movements.
4. Preventible — permanent immunity can be established by (a) exposure and recovery, or (b) vaccination.	4. No known immunity established even after exposure and recovery.

Isolation Of Distemper Virus From Tne South American Maned Wolf (*Chrysocyon jubatus*)

VICTOR J. CABASSO,* Sc.D., CHARLES R. SCHROEDER,** D.V.M., and MAX R. STEBBINS,* M.S.

AS far as can be gathered from the available literature, the susceptibility of the wolf to distemper virus has been assumed on the basis of the relation of this species to the domestic dog, and recognition of the disease in wolves seem to have been based solely on clinical observation and gross pathology findings[1]. As is well known, this is not the case for distemper in dogs, mink, and a variety of wild carnivores, [1, 2] in which the infection has been substantiated by either pathological examination, ferret inoculation, or both. The object of this communication is to report the isolation and identification of distemper virus from a South American maned wolf pup, which seems to have acquired the infection under somewhat unusual circumstances.

Materials and Methods

Susceptible ferrets. The ferrets used in this study were young adult animals bred on an upstate New York farm. When brought to the laboratory, they were kept under strict isolation at an adequate distance from the infected area, and were cared for by separate attendants.

Immune ferrets. Distemper immune animals are always kept on hand for the purpose of rapid isolation and identification of distemper virus from field or experimental cases of the disease. Immunization is accomplished by administering 1 ml. avianized® distemper vaccine to each animal intraperitoneally. Resistance to distemper is checked 10 to 14 days following vaccination by a severe intraperitoneal challenge with the Lederle stock strain of virulent distemper virus[3].

Susceptible puppies. Litters of puppies used for distemper and hepatitis experiments are secured from private sources. Before coming to the laboratory, the puppies are held with their mothers in complete isolation from time of birth until weaned. They are then received in the laboratory where they are kept in isolation quarters under careful observation for at least two weeks before they are used. During this entire period temperature readings and leukocyte counts are made daily, and a serum specimen taken on the day of the experimental inoculation must be negative for both distemper and canine hepatitis complement-fixing antibodies.

Case History

The South American maned wolf (fig. 1) is a rather rare species and, at the time of this study, there were only three specimens in the United States, at the San Diego Zoological Gardens; one male and two females. The male died shortly before the episode to be described, and on December 30, 1954, one of the females gave birth to a litter of two pups, one male and one female (fig. 2). On the same day, however, the mother disowned her pups, which had been thoroughly chilled at birth. They were removed to the hospital at once and were promptly given to a foster mother; a little mongrel dog secured from the local humane society with two puppies of her own born a few days earlier. Every effort was made to clean the foster mother and her puppies as best possible before placing the maned wolf pups in contact with them. The wolf pups did not do well, however, and went off feed promptly. Despite treatment with aureomycin® and distemper-hepatitis bivalent antiserum, they failed to recover their appetite and declined rapidly. One died on January 4, 1955, and the second two days later. The spleen and a section of the liver were at once removed from this latter animal, placed in a sterile vial, fast frozen in dry ice, and shipped by air to the laboratory in a thermos bottle.

At the time of death, the wolf pups weighed 11 ounces. Gross lesions at necropsy consisted of catarrhal enteritis with some hemorrhage in the lower gastrointestinal tract, hemorrhagic areas in the liver, some pulmonary hemorrhage, and swelling and congestion of the kidney.

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®Lederle Laboratories Division, American Cyanamid Company, Pearl River, N. Y.

Fig. 1. South American Maned Wolf. One of only two specimens in the United States.

It is noteworthy that the dog puppies remained normal throughout this episode, and were still in apparent good health on January 31, 1955.

The glass portion of the thermos bottle, upon arrival at the laboratory, was found to have been completely shattered in transit, and the tissues had thawed out. Nevertheless, they were immediately refrozen and the following tests were subsequently performed:

Puppy Inoculations. On January 11, 1955, two normal Cocker X Basenji puppies, four months of age, were each inoculated with 0.15 ml. of a 10% pooled spleen and liver suspension in the anterior chamber of the left eye, a most sensitive route for the detection of infectious canine hepatitis virus. The inoculated eyes remained normal throughout the observation period. Thus no infectious hepatitis virus appeared to have been present in the inoculum.

Fig. 2. South American Maned Wolf puppies.

Neither could intranuclear inclusions be found by the examination of sections of the liver specimens. However, both animals exhibited signs quite characteristic of distemper; diphasic temperature curves, decreased leukocyte counts, and increased blood sedimentation rates. These changes were accompanied by inappetence and loss of weight. One puppy was destroyed on the 14th day, at the height of the second thermal phase, and its tissues were injected into ferrets as described below. The second was sacrificed in an emaciated condition 27 days after inoculation.

Ferret Inoculations. (1) Also on January 11, 1955, two normal and two distemper-immune ferrets were each inoculated intraperitoneally with 2 ml. of the 20% tissue suspension derived from the wolf pup. The normal ferrets exhibited signs of distemper beginning on the 10th day following inoculation, and both were destroyed when moribund on the 14th day; whereas the two immune animals remained healthy and normal in appearance.

In addition to the initial isolation of the virus in ferrets, three additional consecutive passages of the agent were made in the animals as shown in table 1. In every instance, normal ferrets developed typical distemper and either died of the infection or were sacrificed *in extremis,* whereas immune animals remained well for 30 days.

(2) On February 17, 1955, two normal and two immune ferrets were similarly inoculated, each with 1 ml. of a 20% spleen suspension derived from the puppy destroyed on the 14th day (see above). Here again, the normal animals developed distemper and were sacrificed when moribund on the 16th day, whereas the immune ferrets remained healthy for the 30 days of observation.

From the results of inoculating both puppies and ferrets, it can safely be concluded that distemper virus was present in the tissues taken from the wolf pup.

Discussion

From the data presented, one can not ascertain whether distemper infection alone was responsible for the death of the maned wolf pups. Since both animals went off feed shortly after birth, it is likely that starvation also played an important role. A most interesting point is that the foster mother and her own puppies remained in apparent good condition throughout the episode. One must assume, however, that they were responsible for transmitting the infection to the wolf pups almost

upon first contact, either as active or mechanical carriers of the virus. It is most probable that the female dog was immune to distemper and that her puppies owed their early resistance to it to the passive immunity acquired mainly by the ingestion of colostrum,[4] which the wolf pups did not receive in sufficient quantity because of their failure to suckle.

Summary

Distemper virus was isolated in both puppies and ferrets from a suspension of pooled spleen and liver from a South American maned wolf pup. The agent was subsequently passed in ferrets for four consecutive transfers. Infectious canine hepatitis virus was not present in the original tissues.

It seems highly probably that the wolf pups owed their distemper infection to their dog foster mother, the puppies of which remained normal. The implications of this selective distemper infection have been briefly discussed.

TABLE 1. Summary of Passage of Maned Wolf Distemper Virus in Ferrets

Passage No.	Ferret No.	Status	Days to First Sym.	Outcome
1	1	Susceptible	10	Sacrificed 14 days
	2	"	10	"
	3	Immune	—	Remained Normal
	4	"	—	"
2	5	Susceptible	14	Sacrificed 18 days
	6	"	15	"
	7	Immune	—	Remained Normal
	8	"	—	"
3	9	Susceptible	11	Sacrificed 15 days
	10	"	13	"
	11	Immune	—	Remained Normal
	12	"	—	"
4	13	Susceptible	14	Found dead 18 days
	14	"	14	Sacrificed 18 days

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Incidence of Rabies — 1955

Dr. James L. Hourrigan, chief, Special Diseases Eradication Section, Animal Disease Eradication Branch, A.R.S., USDA has released statistics on the number of cases of rabies in the United States during the calendar year 1955. This material was compiled from answers to questionnaires sent by the Branch to livestock sanitary officials and health officers in each state. When a difference was noted in the state reports, the greater number was used, it is believed that reported cases do not represent all that occur.

No rabies was reported from 14 states and the District of Columbia. A total of 5,844 cases were reported from 34 states. Five cases were reported from Alaska, and 26 from Puerto Rico, of which 16 occurred in the native mongoose. Hawaii reported that rabies has never occurred in the Territory.

Five cases of human rabies were reported, two of which occurred in Texas and one each in Pennsylvania, Tennessee, and Wisconsin.

Texas again has the dubious distinction of reporting the largest number of cases—704, of which 497 involved dogs; 25 cats; 25 cattle; 81 foxes, 60 skunks; two coyotes; and 12 miscellaneous animals. A total of 517 cases occurred in New York, involving 42 dogs, 37 cats, 240 cattle, 4 horses, 3 sheep, 6 swine, 167 foxes, 2 skunks, 15 racoons, and 1 otter. California reported 425 cases distributed among species as follows: Dogs 246, cats 3, cattle 9, goats 1, foxes 9, skunks 141, raccoon 1, bobcats 3, bats 2. Alabama, Iowa, and Virginia reported over 300 cases; Georgia, Kentucky, Missouri, South Carolina, Tennessee and West Virginia over 200. An average of 172 cases per state occurred in those states reporting any cases, although approximately half of the 34 reported less than 100 cases.

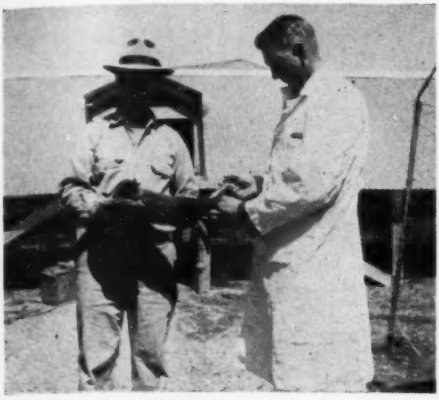
Incidence pattern is not dissimilar from that reported for 1954. The report also points up the fact that rabies in the United States continues to be a disease problem of considerable importance and concern to livestock and public health officials.

▼ ▼ ▼

Hematoma

Surgical technic for relief of hematoma on the ear of a dog is simply to remove two elliptical sections of skin, approximately 1/4 in. wide and ¾ in. apart. Allow to drain Suture through ear cartilage. Healing is prompt and recurrence prevented. Routine bandaging.—*Wm. F. Jackson, D. V. M.*

Control of Botulism in Mink



Dr. Austin E. Larsen, Salt Lake City, Utah shown vaccinating mink restrained by the owner. Readers are referred to Doctor Larsen's discussion of Breeding and Disease Problems in Mink appearing in VETERINARY MEDICINE for June 1956 (page 273).

Doctor Larsen recounts his experience and research studies on the control of botulism in this species by vaccination employing a specially prepared toxoid.

▾ ▾ ▾

Thirty years ago goitre in young puppies and in some middle-aged dogs was seen every year by veterinarians, at least those located in the Northeast. I have not seen such a case in over two decades. I attribute this to be the result of widespread use of iodized salt.—*H. C. Stephenson, D.V.M.*

▾ ▾ ▾

Optimum age of a puppy for ear trimming is at that point when ears begin to show evidence of rising toward a standing position. *R. A. Stocking, D.V.M.*

Operative Technic for Removal of Anal Sacules

Infection of the anal saculations in dogs is responsible for much skin disturbance. Dr. R. A. Stocking, Los Angeles practitioner, demonstrated his technic for surgical removal at the Annual Conference for Kansas Veterinarians, held at Manhattan, June 1-2, 1956.

Technic involves the injection of a small quantity of plaster of Paris into the emptied gland after through cleansing of the site. After the plaster has hardened, incision is made over the fundus of the gland which is carefully dissected out and tied off near the opening to the anus. Wound is closed by dermal suture. Healing is prompt by first intention, according to Doctor Stocking.

▾ ▾ ▾

Unveil Portrait of Dean

Unveiling of a portrait of Dean Robert Graham, retiring head of the College of Veterinary Medicine, University of Illinois, Urbana, was featured at a dinner honoring Dean Graham on May 24, 1956. Dr. Roger P. Link, faculty member, presented the portrait to the University on behalf of alumni and faculty of the veterinary College.

Dean Graham associated himself with the University of Illinois in 1917 as professor of animal husbandry and hygiene. He also was head of the Department of Veterinary Science prior to the establishment of a College of Veterinary Medicine in 1945 at which time he was named dean. The first class was registered for the professional curriculum in 1948 and graduated in 1952.

Dean Graham will relinquish his executive duties as of September 1, 1956.

Presentation of Portrait of Dean Robert Graham. Pictured (l. to r.) U. I. President David D. Henry, who accepted the painting; Robert Kevin Graham, Seymour, grandson of the disttinguished educator; Dr. Roger P. Link; and Dean Graham.

American Animal Hospital Association

Over 750 veterinarians interested in improved service to pet owners attended the 23rd annual meeting of the A.A.H.A. held at Miami Beach, Florida May 23-26, 1956.

Television demonstrations sponsored again this year by the Allied Laboratories and the Radio Corporation of America featured a full technical program prepared by the Program Committee headed by Dr. James E. Greene, Auburn, Alabama. Dr. William F. Irwin presided at this meeting. A post-convention trip combining business and pleasure was sponsored by Cuban veterinarians.

Committee Reports

Much informative material was presented as Committee Reports by hard working committeemen. These were distributed to members prior to meeting date in order to allow time for questions and discussions.

Significant trends are evident in these reports. As an example a portion of the report of the Committee on General Surgery suggests wider use of equipment and methods designed for sterile operative technic. A questionnaire returned by 221 members of the Association indicated the following:

Used Equipment	Spay		Surgery Tonsilectomy		Cesarian section		Open Fracture Reduction	
	No.	%	No.	%	No.	%	No.	%
Surgical Cap	31	14	13	6	41	19	46	20
Surgical Mask	22	9.5	7	3	38	17	42	19
Gown	131	59	97	44	147	66	145	65
Gloves	149	67	69	31	164	74	164	74
Scrub with antiseptic soap	207	94	181	82	207	94	209	95
1 Assistant	145	65	142	64	99	45	130	59
2 Assistants	12	5	21	9	86	39	59	27

Dr. Paul T. Candlin reported favorably on a new apparatus and trichloroethylene gas for anesthesia of cats.

The American Animal Hospital Association has not only grown in stature because of service to its members, but in numbers listed on its roster. A total of 307 active member hospitals represent the association from coast to coast and in Canada. There are also listed 11 past active members representing those former members who have retired or disposed of their practice and 28 associate members representing veterinarians in several capacities all interested in professional service for pets.

Dr. J. H. Yarborough

La Fond Memorial Fund

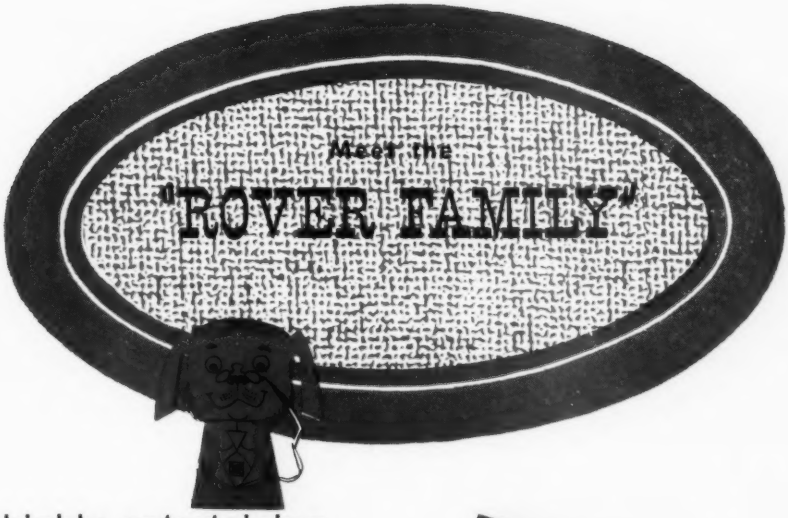
Dr. Ralph E. Ruggles, chairman of the Memorial Committee reported that funds collected to commemorate the service of the late Dr. Louis H. La Fond to the A.A.H.A. totalling $1900. was used to expand and revise the book Planning Your Animal Hospital. The first edition of this useful text has been exhausted and the La Fond Memorial Edition was dedicated at the opening session of the Miami meeting. A copy of the new edition is available from the executive secretary.

New Officers

Dr. James A. Yarborough, practitioner at Miami was installed as president at the closing session. Other officers selected to serve the Association for the coming year include Dr. Joseph A. R. Millar, Deal, N. J., president-elect; Dr. William G. Magrane, Mishawaka, Ind., vice president; Dr. Wayne H. Riser, Skokie, Ill., executive secretary; and Dr. Arthur R. Theobold, Cincinnati, Ohio, treasurer.

▼ ▼ ▼

Scientists of the Noal Medical Research Institute have transplanted successfully bone from various animals into dogs without difficulties usually associated with interspecies grafts. Bone tissue employed is treated chemically to remove proteins and associated substances that ordinarily are responsible for destructive antigenic response. *Medical News, May 7, 1956.*



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(Continued from page 318)

ductive tract for relatively long periods of time. Focal hepatic necrosis was the most consistent lesion observed in the infected young. While these studies were in progress somewhat similar findings in rabbits and a goat exposed orally were reported by Hahnefeld[23] and Hahnefeld and Nisolk[33]. These findings together with the fact that in the present study some calves died as early as the second postpartum day strongly suggested prenatal infection.

The mode of infection in the dam remains obscure since several portals of entry may be incriminated. In addition to ocular and oral exposure indicated previously[19-33], the possibility of a venereal mode must be considered also. *L. monocytogenes* was isolated from the vaginal mucus of a cow by Stenberg[24] and from the cervix of a so-called repeat breeder cow by Gray and McWade[25]. Wenkebach[26] isolated *L. monocytogenes* from the urethral exudate of five men with gonorrhea. Although no pathogenic role could be established in these instances, they emphasize the possibility of venereal transmission. Although experimental evidence is presently lacking, the respiratory tract may play a role in the pathogenesis of listeric abortion and/or early death of young. Trauma was suggested as a possible mode of infection in the recent case of listeric abortion in a cow reported by Smith *et al.*[27]... Oral exposure has been suggested by most of the German authors in the numerous outbreaks of granulomatosis infantiseptica[10-18]. Most of the women were from rural areas and many of them included raw cow or goat milk in the diet. The cows in the present study might have been exposed orally, but convincing evidence is lacking.

Erdmann and Potel[28] suggest the following sequence of events leading to infection of the young: Infection of the dam; transfer of the bacterium across the placenta, resulting in septicemia with development of lesions in the fetus; shedding of the bacteria through the urine infecting the amniotic fluid; aspiration of the infected amniotic fluid resulting in a secondary infection of the fetus by way of the respiratory and digestive tract. Infections under both field and laboratory conditions appear to support this suggestion.

It appears more than coincidental that septicemic listeriosis occurs rather frequently in monogastric animals and only rarely in ruminants. The report by Jansen and vanden Hurk[29] of an acute, listeric septicemia in an adult goat is a notable exception. Occasionally *L. monocytogenes* has been isolated from the liver, spleen, and cardiac muscle as well as the brain of sheep which had typical encephalitic symptoms before death. There are numerous reports of listeric septicemia among rodents and fowls, but the localized encephalitic form has been reported in these animals only by Traub[20].

The contribution of *L. monocytogenes* to the cause of neonatal death in calves remains to be determined. These observations suggest that it may play an important role. Rubarth and Wollarz[8] examined 250 livers from suckling calves which showed miliary foci at meat inspection and found all of them to be infected with *L. monocytogenes.* In no instance did they isolate Salmonella, the organism which in the past has been most commonly associated with this lesion. This emphasizes the need for re-study of the causes of liver necrosis in young calves. This is especially important in view of the reports of the German authors[10-18] who, in the past few years, have demonstrated convincingly that the so-called "pseudotuberculosis" of infants is actually a listeric infection.

The difficulty in isolating *L. monocytogenes* from fresh animal tissue is not clearly understood. Recent evidence[19-21,31-34] re-emphasized the need for maceration and refrigeration[9,34] of all tissue when culturing for the presence of this bacterium. Of the six isolations reported here there was a heavy growth of *L. monocytogenes* in only one. One culture produced only one colony, another three, and the remaining four yielded from five to 50 colonies. *L. monocytogenes* never was isolated from the intestinal tract although stained smears of the contents revealed what appeared to be large numbers of bacteria resembling this species. This also was experienced by Harbour[9]. In neither instance was the material refrigerated. If these bacteria actually were *L. monocytogenes,* the failure to isolate them stresses both the need for using the refrigeration technic[9,34] before calling a culture negative and also the need for a more effective medium for isolation. In all instances, a large inoculum should be employed. With refinements of isolation technic, it may be revealed that *L. monocytogenes* plays a more important part in animal disease than has been suspected to date.

Summary

Listeria monocytogenes was isolated from the livers of six calves less than 19 days of

age. The predominant symptoms were general weakness and loss of weight. The most consistent lesions at necropsy were hepatic necrosis and gastroenteritis. It was suggested that the role of *L. monocytogenes* in abortion and/or early death of young may be of greater importance that previously suspected.

NOTE: While this manuscript was in preparation *L. monocytogenes* was isolated from the liver of a calf in a widely separated herd. History and lesions were similar to those described above.

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Rank of Livestock Producing States

Latest livestock and meat situation report of the U. S. Department of Agriculture gives numbers of cattle on farms as of January 1 (beef cattle and dairy cows tested separately) and numbers of pigs sold in 1955.

Texas is a far-ranking first in number of beef cattle and beef cows over two years of age with a total of 7,338,000 cattle and calves. Iowa, Nebraska, Kansas, and South Dakota follow in rank in the order given. Wisconsin leads the list of ranking states in number of milk cows two years of age and over, followed by Minnesota, New York, Iowa, and Pennsylvania. One-third of all milk cows in the United States are found within the borders of these states.

Management of an Actinomycosis Outbreak in Feeder Cattle: A Case Report

J. B. KEY,* D.V.M., and L. P. LOFFER,** D.V.M.

Udall[1] describes actinobacillosis as a chronic infectious disease affecting chiefly the soft tissues of the head of cattle. It is caused by *Actinobacillus lignieresi* and the condition is widely prevalent in the western plains of the Mississippi Valley and in the Rocky Mountain states. The statement that cattle fed on coarse roughage are more subject to the disease may be questioned. The lesions of the clinical forms of actinobacillosis of the soft tissues of the head or neck are chiefly of the nature of an infectious granuloma, containing foci of pus. Treatment with iodine in the form of potassium iodide orally or sodium iodide intravenously has proven effective and convenient for this condition.

This report involves a group of 1,400 feeder cattle that were in the final phase of a feeding program and were scheduled for shipment in about three weeks. They were on a full feed of grain and alfalfa which had been finely ground with a hammer mill. The owner asked for veterinary assistance after a few cattle had died, a large number were salivating excessively, and weight gains were drastically reduced. Examination revealed that some of the animals had edematous areas in the submandibular region. Several exhibiting these lesions were slaughtered, and specimens submitted to the State Veterinary Control Service Laboratory at the University of Nevada. A diagnosis of actinobacillosis was made.

As soon as possible, the obviously affected animals were segregated from the herd and individually treated with an ounce of sodium iodide powder dissolved in 40 cc. of water. The solution was prepared in this concentration to hasten the therapy procedure, as this amount could be rapidly injected into the jugular vein with a 40 cc. syringe. These 160 animals were then held in a separate pen to be observed for clinical response to the treatment.

It was soon apparent that the disease was continuing to adversely affect increasing numbers of animals in the untreated group; so it was decided to treat the remaining 1,240 animals with oral iodine therapy. A powder containing ethylenediamine dihydriodide (hi-amine compound®), was added to the ration on the basis of 1 oz. daily per animal. The ration was divided into morning and night portions, so calculated that each animal would receive 10 gr. of ethylenediamine dihydriodide at each feeding. The 160 head of sodium iodide treated cattle were fed on an unmedicated ration in order that they could serve as controls.

Within 72 hours, it was obvious that the orally medicated cattle were responding to treatment, as their appetites and overall appearance had improved markedly. The owner, an experienced feeder, was so impressed with the results obtained by the hi-amine medication that he decided we should also extend it to the 160 sodium iodide treated cases, which had not responded satisfactorily. The medicated feed program was used for ten days; so the majority of the animals received 100 gr. during this period. The cattle made a complete recovery and were marketed on schedule.

Comment

We believe the outbreak occurred in these cattle as the result of a radical change in feeding procedure. The hammer mill had broken down and the ration had been changed from a finely ground consistency to a coarse mixture, which resulted in the stemmy alfalfa lacerating the mucous membranes and providing a portal of entry for the organism. It should be pointed out that the cattle were being fed in lots that had been used for many years and, undoubtedly, the etiological agent was present abundantly in the soil, watering equipment, and feed troughs.

The beneficial response which followed the addition of the hi-amine to the feed was extremely gratifying to all concerned and in this instance the medicated feed program used was more effective and practical than was the intravenous injection of sodium iodide.

Krause[2] reported that multiple throat abscesses of swine can be controlled satisfactorily in a problem herd by adding hi-amine compound to the ground ration at the rate of 2 oz. per 100 lb. of feed for five to seven days.

It should be emphasized that the problem confronting the owner of cattle subject of this case history was one of insidious nature. Even though death losses had been slight, each day a substantial financial loss resulted from the weight loss or poor gains. Prior to the outbreak, the cattle were gaining at the rate of 2.5 lb. per head per day.

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*Reno, Nevada.
**San Francisco, California.

®Pitman-Moore Co., Indianapolis, Ind.

After the 160 head were selected for intravenous sodium iodide therapy, a dilution of 1 oz. of the drug to 250 cc. of water was used initially. As evidence of serious toxicity was lacking following this dose, the amount of water was decreased until only 40 cc. were used. With the exception of the first few animals, the 40 cc. dose was injected as rapidly as the cattle could be brought into the chute. Several of the cattle went down on their knees after being released, and many showed increased respiration. No other evidence of toxicity or shock was noted.

This outbreak was of particular interest to us because of the large number of animals involved, and the insidious nature of the infection. The majority of the cattle were not obviously sick, so an inexperienced observer would have been unaware that a disease problem existed. The ability of experienced cattlemen to detect any deviation from normal in their animals was well demonstrated in this instance.

Summary

A herd of 1,400 feeder cattle developed actinobacillosis apparently as a result of a radical change in the feeding program. The animals showed salivation, submandibular edema, and weight loss or poor gains. One hundred and sixty of the infected animals were treated with an ounce of sodium iodide intravenously in 40 cc. of water and the remaining animals medicated *via* the feed with ½ oz. of hi-amine compound (10 gr.), morning and night for a ten-day period. Clinical response was rapid and effective. All animals were subsequently treated orally through the feed. Recovery was prompt and complete.

Sincere appreciation is extended to Dr. Edward Records for his advice in preparing this paper.

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Anthelmintic treatment of swine is recommended not alone for its effect on growth and development of those treated, but for subsequent generations scheduled to be raised on ground occupied by the swine treated. Reduction of number of ova deposited on soil that become infective to future pigs makes treatment economically sound and practical.

Halogeton a Growing Problem

Halogeton, a Russian thistle-like plant originating in Asia and thriving on western range lands since 1935, is posing a growing problem to sheepmen and cattlemen alike.

The plant thrives on cattle and sheep trails and where native grasses have been overgrazed or drouth damaged. Poisonous principles of the plant are oxalates, the action being to draw calcium from the body to form calcium oxalate to the extent of fatal depletion of calcium content of body fluid. (See VETERINARY MEDICINE, 46:33 [Jan.], 1951).

Control efforts have been toward range improvement by grass seeding. Halogeton has difficulty competing with good range grasses. Weed killers are economically impractical. Entomologists have been brought in by those concerned with control in the hope that an insect can be introduced that will parasitize the noxious plant without damaging other forage. Strangely sheep and cattle find this plant palatable.

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Vesicular Exanthema Quarantine Released in California

When vesicular exanthema spread out of California to every important swine producing section of the nation in 1952, the entire state of California was placed under federal quarantine. As the disease was pushed back, counties and other limited areas were released. Now official announcement has been received that the quarantine has been released from all areas in California. Movement of swine and pork products may now reenter interstate trade.

All known infection have been stamped out in California. Success of this effort must be credited largely to cooperation of garbage feeders in following recommendations for cooking garbage, and the state's law requiring that garbage be cooked before being fed to swine. All garbage fed in California has been cooked since January 1, 1956.

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Cadmium salts are readily absorbed and picked up by tissues throughout the body of an animal given therapeutic dosage as anthelmintic treatment. Slaughter of treated animals should be delayed for at least 30 days after treatment. *L. Meyer Jones, D.V.M.*

EDITORIAL COMMENTS

Secretary of Defense Wilson Proposes to Abolish the Veterinary Corps

Defense Secretary Charles E. Wilson proposes to amputate the Veterinary Corps from the Army and the Air Force by "directive". In effect the Secretary directs the preparation of specific plans, to implement liquidation of the Veterinary Corps, for his approval by 1 July 1956. He indicated that "—it appears that the various functions of the Veterinary Corps of the Army and Air Force should be reassigned, discontinued, and/or obtained by contractual arrangements". It is understood that the directive affects the entire veterinary establishment in both the Army and Air Force. It calls for "orderly and equitable disposition to be made by release from active duty, transfer, reassignment or otherwise, of all veterinary personnel (approximately 774 officers and 2,200 enlisted men) performing functions to be eliminated in response to this memorandum. This would terminate the further entry of Army and Air Force officer and enlisted personnel into specialized veterinary training courses." It also directs deletion of construction funds from budgetary programs. The effect of the directive on the Veterinary Reserves programs is discontinuation of both activities and functions of reservists and the training of Veterinary Reserve officers. The Secretary apparently presumes, by his directive, to override an act of Congress (H.R. 5794, Sec. 307) which provided the Veterinary Corps within the Army Medical Service of the Department of the Army.

It was pointed out in debate that there were more officers in the Veterinary Corps than horses and mules in the Army. Inference drawn from this statement appears to be designed to illustrate that it was ridiculous to maintain a Veterinary Corps in this atomic age. The absurdity of the comparison of strength of veterinary personnel to animal strength ranks with some other examples of nondiscernment, even considering its geographical origin.

Service chiefs of both the Army and Air Force have indicated concern over threat to the health of military personnel in the event that functions of the Veterinary Corps were curtailed. Military planners are "disturbed" from the point of view of mobilization readiness and Army researchers are "upset" because of the use of many animals species in research projects relating to atomic and bacteriological warfare.

The mission of the Veterinary Corps was set forth in the hearing by General Lawton of the Department of the Army. Misconceptions of the function of veterinary officers was pointed out in General Lawton's statement. Inspection of meats and meat products for wholesomeness has been directed, supervised, and operated by graduate veterinarians since the genesis of meat inspection in the United States. The Agriculture Research Service is now celebrating the 50th Anniversary of the Meat Inspection Act and lauding the services of veterinarians as responsible for the success of the program. Food inspection responsibilities have been multiplied in recent years for reasons of providing for increased variety in the soldier's diet and the policy of purchasing from indigenous sources for troops stationed in widely scattered points throughout the World.

Veterinarians have been employed by the Army as food inspectors since 1901 following the disastrous food-poisoning outbreaks among American troops during the Spanish-American War. Military history does not record a single comparable incident to the experience in 1901 since that date covering two World Wars and the Korean "episode". All professions interested in public health are aware of zoonoses and the potential danger of unwholesome food of animal origin. These persons are also aware of the health hazards of meat as potential media for transmission of human diseases and contamination; thus the "sense" of control from production to issue to troops. Further weight is given the respnsibility of veterinary officers in the performance statistics for 1955. During the 1955 government fiscal year 1,469,-026,000 lb. of foods of animal origin were subjected to procurement inspection, the approximate cost of which was $661,061,700. Total amount of all food products inspected by the Veterinary Corps during the same period was 22,240,070,000 lb.; a sizeable amount of which was in overseas areas.

Inspection of food for military personnel is not the only service the Corps performs for the military establishment by any means. It functions with other specialists on public health teams in the field of preventive medicine. Analysis of these duties shows with reasonable clarity the essential services of veterinarians. A study directed by the Chief of Staff also

(Continued on page 342)

Golden Anniversary of Federal Meat Inspection

Secretary Benson officially opened a national exhibit on June 6, 1956 (pictured below) commemorating the 50th anniversary year for federal meat inspection. The Office of Information in Washington has prepared an appropriate celebration program, including fact sheets and a pictorial story having a theme, "Fifty Years of Meat with Approval." This kit of material will be made available to all public information media including radio, television stations, newspapers, and magazines during the summer and early fall.

On June 30, 1906, Congress passed a law requiring federal inspection of all meat and meat food products moving through interstate and foreign commerce. This law, referred to as the Meat-Inspection Act, has proved its soundness as a public health measure.

Who shall make the inspection was not indicated in the Act. The Secretary of Agriculture, however, was charged by the Act to ". . . cause to be made by inspectors appointed for that purpose, as hereinafter provided, a postmortem examination and inspection of the carcasses and parts thereof of all cattle, sheep, swine, and goats to be prepared for human consumption." Selection of trained veterinarians to be thereafter responsible for production of clean, sound, and wholesome meat was made early because such professionally trained men alone were qualified to pass judgment on whether or not meat slaughtered was wholesome.

Accomplishment of objectives set forth in the law are apparent in the fact that 80% of the nation's commercial meat supply bears the little purple stamp, "U. S. Inspected and Passed," on which the consumer now places explicit confidence. Had it not been for the application of good scientific principles with which veterinarians are familiar, cooperation of 1,154 meat processing establishments would not have been possible. In these, more than 100,000,000 meat animals are being slaughtered annually and the number is increasing. Veterinarians carry the responsibility that the meat from every carcass is fit to eat.

The responsibility is a grave one which should be of vital interest to every one who eats meat. Veterinary inspectors have performed their duties modestly and without fanfare. The public owes the man who wears the eagle mounted badge of the veterinary meat inspector an incalculable debt of gratitude. His application of professional training and experience acquired after tedious years of scientific study has touched the lives of every American citizen. Adequate veterinary inspection of meat under the Act has given consumers assurance of wholesomeness of meat food. It has also stimulated the livestock industry which has enjoyed a growing demand for its product resulting from consumer confidence.

The total effect has been the assurances of robust health of the population and increased national wealth. In both respects it may be considered to be one of the most important legislative actions ever taken by the Congress of the United States.

50th Anniversary
FEDERAL MEAT INSPECTION
Every minute of every working day [illegible] meat animals are Federally inspected.
Veterinarians and trained Meat Inspectors are dedicated to assuring the production of clean, sound, wholesome meat free from adulteration and truthfully labeled.

Blood Test of Veterinary Practitioners

An announcement in the program for the 22nd Annual All-Day Practioners Clinic of the Eastern Iowa Veterinary Association held in Cedar Rapids on May 8, 1956 invited all veterinarians present to have their blood tested for leptospirosis.

Two technicians from Mercy Hopsital were at hand and collected 60 samples: Dr. R. V. Johnston, Pitman-Moore Co., Zionsville, Ind., conducted the rapid plate test for leptospirosis using the Stoenner antigen. That State Hygienic Laboratory, under the direction of Dr. I. H. Borts conducted tests for brucellosis, Q fever, and psittacosis. Results were tabulated and supplied for publication through the courtesy of Dr. F. E. Brutsman, secretary (since succeeded by Dr. Wayne H. Thompson, Earlville) and Dr. Wm. M. Lynch, chairman, Public Health Section.

Reaction Titer of 60 Blood Samples Collected from Eastern Iowa Veterinary Practitioners

Disease	Number Positive	Highest Titer	Reaction Rate %
Leptospirosis	4	1:640	6.6
Brucellosis	23	1:640	38.3
Q fever	2	1:16	3.3
Psittacosis	6	1:4	10.

Agricultural Statistics

Receipts from the sale of livestock, including poultry, and their products for the calender year 1955 in California totaled $949,000,000. Milk was the leading item—sales amounting to $313,000,000., cattle and calves followed closely while eggs were third-place income producers accounting for $149,000,000. of the total.

Influence of Fat Globule Size on the Milk Ring Test

A result of a series of tests by Ogonowski, as reported in *The Veterinary Record* for December 24, 1955 regarding the Relationship Between the Milk Ring Test (Brucellosis) Results and the Size and Disparity in Size of the Fat Globules is summarized as follows:

"Milk from infected cows—

1. "Constantly negative when the fat globules were of uniform and predominantly small size.
2. "Invariably positive when the fat globules showed a marked difference in size."

It is mentioned that the foregoing results may explain, in part, the occurrence of false-negative ring test results.

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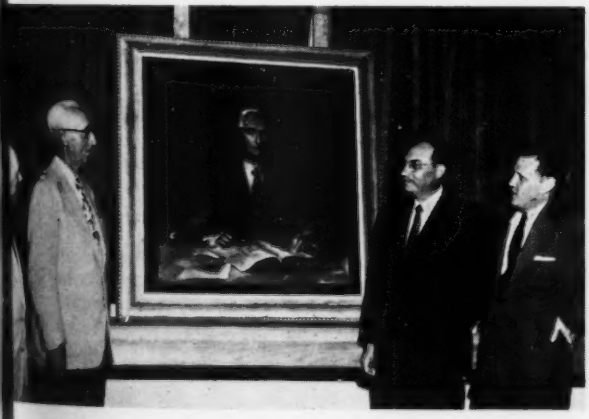
Present Portrait of Dean Emeritus R. R. Dykstra

Presentation of a portrait of Dr. R. R. Dykstra, dean emeritus of the School of Veterinary Medicine, Kansas State College, Manhattan, highlighted the banquet session after the first day of session of the Annual Conference for Kansas Veterinarians held in Manhattan, June 1-2, 1956.

The portrait, work of artist Robert McD. Graham, Kansas City, Mo., was unveiled by Mrs. Dykstra and presented by Dr. C. W. Bower, Topeka on behalf of the veterinary alumni. President James A. McCain accepted the painting for the College. It is intended to be hung in the new hospital designated the Dykstra Animal Hospital which was dedicated on the Kansas State College campus in June 1955.



Presentation of portrait of Dr. R. R. Dykstra. Pictured (l. to r.) Robert McD. Graham, Kansas City, Mo., artist who painted the portrait; Doctor Dykstra; Dr. C. W. Bower, Topeka; and K.S.C. President James A. McCain.

Dried Rumen Organisms

Rumen changes, or those affecting types and number of microorganisms present, can be corrected by incorporating dried rumen bacteria in the ration of cattle, according to Dr. Charles W. Turner writing in *Feedstuffs* for May 19, 1956.

He stated that while freshly harvested rumen bacteria (rumen transplant) is ideal material whenever healthy ruminants are available, practical use of bacteria requires that they be dried, thus rendered suitable for storage, transportation, and available when needed.

Technics in the preparation of dried rumen organisms have advanced to assure vitality and function for cellulose digestion. The author refers to research data that proves both cellulytic activity and protein synthesis of these minute forms, subjected to lyophilization. Number per gram of material may be counted; presence of pathogens determined.

Having a suitable mixture of dried organisms at hand, it is now possible to test their usefulness and value. So far trials have indicated early initiation of rumination in calves, increased utilization of roughage for growing, fattening, and milk production, and finally serving as supplementary therapy in a number of metabolic disturbances.

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Veterinarians in the News

News and views of personnel, visitors, and patients at the Davis Animal Hospital, Stanford, Conn. occupy a prominent position in *The Saturday Evening Post* for May 19, 1956. "Your Dog's Next-Best Friend," by Barton J. Rowles is well illustrated and complimentary of the services of veterinarians specializing in small animal practice.

Descriptions of patient's ills, procedure examples given, and most of the photographs are well selected. There is also given some general information accurately dealing with problems connected with small animal practice.

Dr. Robert Rands, OSV '38 and Dr. Maurice H. Ryan, ONT '36 operate the Davis Animal Hospital as a partnership. Dr. Sidney Stern, MID '43 is associate staff member.

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The proportion of cases of tularemia transmitted by ticks is apparently increasing in the Arkansas-Oklahoma-Texas area where the lone star tick is a vector.

Doctor M. R. Blackstock Treasurer of the Southern

Dr. M. R. Blackstock was regrettably omitted from the listing of current officers of the Southern Veterinary Medical Association that appeared in VETERINARY MEDICINE for April 1956 (page 145-146). Doctor Blackstock was reelected to the post of treasurer for the Southern, establishing an unbroken record of service since 1928. He is a charter member of both the South Carolina Veterinary Medicine Association, in which organization he has held every executive office, and the Southern Veterinary Medical Association. He acted as secretary-treasurer of the latter from 1928 to 1937, at which time the office was split and Dr. L. A. Mosher was made secretary. Later, in 1946, Doctor Mosher resigned and was succeeded by Dr. A. A. Husman, present incumbent. Doctor Blackstock has continued to hold the office of treasurer to this date. He is now a member of the State Board of Veterinary Examiners and the State Draft Board. He has been the South Carolina delegate to the A.V.M.A. House of Representatives since 1948.

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Brucellosis Testing in Illinois

A total of 50,414 herds including 622,750 cattle were tested for brucellosis in Illinois during the calender year 1955. Reaction rate was determined at 2.3%, suspects 5.7%. Calves vaccinated totaled 131,189. This summary, according to news released from the College of Veterinary Medicine, University of Illinois, is a record of testing and vaccinations by state, federal, county veterinarians, and private practitioners at state expense. It does not include any tests or vaccinations conducted by private practitioners at owners' expense.

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Wilson to Abolish Vet. Corps

(Continued from page 339)

recommended "no change" of status of the Veterinary Corps.

The A.V.M.A. has taken several steps, according to information released by that office, to correct many distortions in stories relative to the mission of the Veterinary Corps and functions of officer personnel of the Corps. It is shocking to learn that what appears to be failure of appreciation of the importance of veterinary aspects of maintenance of the health of troops, or simple ignorance of the functions of veterinary medicince, exists among responsible public servants.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

The Practitioner as a Nutritionist

During The Formula Feed Conference held at Kansas State College, Manhattan, the following statement was made: "The veterinarian is in better position to sell a sound nutritional program than any other individual. He is the only one who is invited by the farmer to help with his livestock problems. His professional background and experience encourage the farmer to rely on the veterinarian's judgment in herd health matters, including disease prevention through sound nutrition. He can really help the feed man introduce sound nutritional programs on the farm. His friendship is certainly worth cultivating."

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Over-Reaction of Pigs to Vaccination

Over-reactions in pigs to the administration of modified live virus hog cholera vaccine without simultaneous administration of hog cholera antiserum is not uncommon. The injection of hog cholera antiserum with tetracycline appears to assist affected pigs to recovery. The diagnosis of the condition is not based on the usual hog cholera symptoms, but rather on the fact that shortly after the use of the modified virus several of the pigs sicken. Most of the affected ones recover without treatment after being off feed for a few days, but to avoid all loss the serum and antibiotic are used.

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Recovered Swine Carriers of Vesicular Exanthema

According to announcement, California scientists have definitely established that vesicular exanthema infected hogs clinically fully recovered from attack of the disease remain as carriers and are potential sources of danger to all susceptible swine. Cooking garbage previous to its consumption by swine appears to be a deterrent to the development of infection. At the time of this writing five states; New Jersey, Pennsylvania, Connecticut, Texas, and Massachusetts, have no garbage cooking laws.

Hog Cholera Antiserum Supplies

Fear has been expressed in some veterinary and livestock circles that in case of an extensive threatened outbreak of hog cholera, similar to the 1926 epizootic, there would not be on hand sufficient hog cholera antiserum. The fear does not appear to be well founded for the following reasons:

1. Federal regulations require producers to have on hand May 1 of each year, 40% of their previous year's sales.
2. In 1926 only hog cholera antiserum and virus were used for immunization purposes. At present two inactivated vaccines, and numerous modified live virus vaccines are available.
3. It is reliably estimated that 65% of the hogs are immunized against cholera each year, and if this estimate is correct it does not appear likely that a wide-spread epizootic can get started, though comparatively small localized areas may beocme involved.

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Posterior Paralysis in Swine

Posterior paralysis in pigs is discussed by clinician J. M. Joyce in the December 1955 issue of *The New Zealand Veterinary Journal.* In the clinical survey conducted by him he postulates that in copper deficient areas the condition may be a copper deficiency. Other possible etiological conditions mentioned include either a vitamin A deficiency or some other substance present in fish-liver oil. Some of the cases reported on the use of copper sulfate in the ration, in copper deficient areas, was helpful. An estimate following the use of fish-liver oil was 70% recovery. A combination of a fish liver-oil and copper sulfate is one of the treatments tried.

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Most practitioners are agreed that it is advisable to wait three or four days after bovine parturition before attempting to remove retained secundines. Certainly if there is evidence of severe systemic disturbance immediate steps must be taken, either therapeutically or manually to correct the situation; otherwise a delay is advisable, thus simplifying removal.

VETERINARY NUTRITION

MORRIS ERDHEIM, D.V.M.
Chicago, Illinois

Stress In Milk Production

One of the newcomers to the nutritionist's vocabulary is the word "stress". A variety of stresses are described, ranging from infectious diseases to management problems and extremes in weather.

The following chart describes graphically some of the stresses applied to the modern dairy cow. The production data represented on the chart were taken from the records of a high-producing four-year-old Holstein.

A number of thoughts come to mind on study of the chart. In the first place, it is realized that the dairy cow is performing a dual function at all times. Milk production must be high. The animal also is involved in calf production; being either pregnant, or nursing a calf. The cow must constantly demonstrate healthy activity in both functions or lose the right to remain in the milking herd.

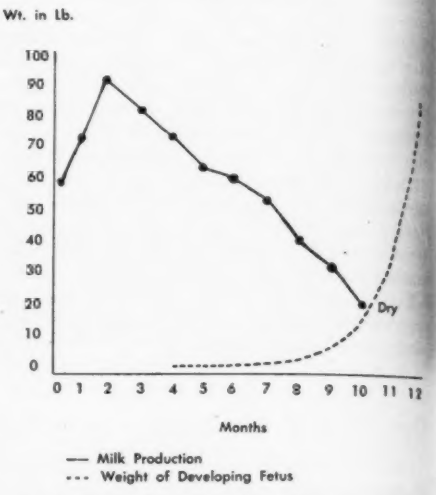
We can also see the need for a dry period. After a cow has had to fulfill the demand for heavy milk production, the dry period offers a rest from that stress, and permits development of the calf. Moreover, preparation must be made for another lactation period.

Unfortunately, additional stresses are placed on this cow during the dry period. In most dairy operations, the dry cow is poorly fed. Dairymen generally give their best hay to the cows in production, because they "need it for production." The dry cow gets the poorest. While a number of well-formulated "dry and freshener" programs are available to dairymen, feeding practices for this group of cows are erratic and without sound pattern.

The fear of bloody milk and mastitis when the cow freshens is also responsible for much of the faulty feeding of the dry cow. It may be true that dry cows which are properly fed come in with a higher incidence of bloody milk. The basic cause, however, is probably not the improved nutrition, but rather the increased stress on the udder brought on by greater milk production. Purdue workers found that when dry cows are properly fed and fitted, they produce 29% more milk in the next lactation than the poorly fed controls.

One can not examine this chart with the word "stress" in back of his mind, without thinking of acetonemia.

Relation Between Milk Production And Fetal Weight In a Dairy Cow



It is generally recognized that acetonemia occurs in high-producing cows. Udall[1] points out that it is seen in well-nourished cows on a heavy diet of rich concentrates. Vigue[3] summarizes some interesting studies on the high incidence of acetonemia in obese cows. In his explanation, he indicates that the lean (not underfed) body mass has a more responsive endocrine system, which would enable it to meet stress situations, such as heavy milking, more effectively than the fat body mass. Too often a cow that looks well-nourished is simply obese.

Cows on good pastures have a much lower incidence of acetonemia[4] even when milk production is high[4].

The subject of ketosis is much too broad for detailed discussion here. However, some current thinking relating the development of metabolic disease to stress caused by faulty nutrition in addition to that of heavy milk production appears to have well documented foundation.

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(Continued on page 346)

EVEN BY AIR...

the veterinarian gets there faster, surer, more economically with Motorola 2-way radio

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POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Lymphomatosis Summary

Lymphomatosis in chickens is completely discussed in USDA Circular 970. This circular was prepared by the laboratory staff of the Regional Poultry Research Laboratory, East Lansing, Michigan. The authors have reviewed the literature on this group of diseases and include a selected list of 40 references on the subject. The various manifestations of the group of diseases (visceral, neural, and ocular) are described and compared with associated diseases such as osteopetiosis and fowl leukemia. Selective breeding and isolation are emphasized as control measures.

The circular is based largely on research work on this group of diseases conducted at the East Lansing laboratory. One significant finding during the past few years is that a different filterable agent is probably responsible for each type of the disease. A review of these findings both by the authors and other investigators is included.

Good illustrations and the list of 40 selected references add much to the value of the circular. It is recommended for your library and can be obtained by writing to the Office of Information, USDA, Washington 25, D. C.

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If you aren't familiar with USDA Monthly List of Publications and Motion Pictures it would be advantageous to have your name put on the mailing list by writing to the Office of Information, USDA, Washington 25, D. C.

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Stress in Milk Production

(Continued from page 344)

2. Vigue, R. F., Evaluation of Some Concepts of Bovine Ketosis From a Practitioner's Standpoint. *Jour. Am. Vet. Med. Assn.*, (Aug.), 1955.
3. Vigue, R. F., Evaluation of Bovine Ketosis Concepts and Therapy, *Jour. Am. Vet. Med. Assn.*, (Apr.), 1955.
4. Phillips, P. H., University of Wisconsin. Personal communication.
5. Vigue, R. F., Influence of Protein on the Milk Fever Complex: Part II Ketosis, *Vet. Med.*, 47:491 (Dec.), 1952.

Treatments for Hexamitiasis of Turkeys

A large number of drugs have been tried as treatments for hexamitiasis of turkey poults, mostly without success. McNeil (*Calif. Agric.* 2 [11]:15, 1948) found that a mixture of 3% dried whey in a 1:2000 aqueous solution of copper sulphate in place of all drinking water was of value. Almquist and Johnson (*Proc. Soc. Exp. Biol. and Med.*, 76:522, 1951) reported preliminary studies that showed terramycin and aureomycin may have some value. Their experiments were not conclusive. A preparation containing tin (dibutyltin dilaurate) also has been reported as being effective by one manufacturer, but as far as is known the scientific findings have not been published.

The latest studies on treatment of this disease are those of Mangrum, Ferguson, Crouch, Wills, and Delaplane (*Poultry Sci.*, 34:836, 1955). These investigators found that furazolidone (N-5 nitro-2 furfurylidene) - (3 amido-2 oxazolidone) given at the rate of 50 mg. per lb. of feed was an effective treatment in reducing mortality if given two days prior to infection or soon after symptoms appeared. Reduction of mortality from 56.5 to 66% in untreated controls to as low as 10% was obtained by treatment under conditions of these experiments.

Hexamitiasis, a protozoan disease of young turkey poults under ten weeks of age is caused by *Hexamitiasis meleagridis*. The disease is characterized by an acute enteritis, accompanied by a severe, foamy, watery diarrhea. For previous reviews the reader is referred to VETERINARY MEDICINE, 43:307 (July) 1948; 43:472 (Nov.) 1948; 45:336 (Aug.) 1950; and 50:196 (Aug.) 1955. A complete discussion of the disease will be found in Biester and Schwarte, Diseases of Poultry, 3rd edition, pages 1178-1184.

▼ ▼ ▼

United States sells $29,000,000 dollars worth of poultry and products to Latin America annually. Fresh eggs account for about $18,000,000. of the total. (*Poultry Tribune*, Nov. 1955).

Produce 3-lb. Broiler on 2 lb. Feed

Designated Broiler Trial 15, Maryland University poultry scientists report producing 3-lb. broilers under practical conditions in eight weeks with a feed conversion rate of 1.96 lb. of feed per pound of live broiler. The trials involved approximately 8,000 Bantress Red and White Mountain crossbreeds of both sexes.

Five feed formulae containing various levels of added fat (0 to 12%) were tested. Best production was reported on pens receiving 12% added fat, although in this percentage most feeds had a tendency to cake. Lesser percentage of added fat were supplied to other lots in pelleted feed.

Conclusions indicate that high fat levels may be used practically in broiler feeds, particularly if lower cost fats become available. The average feed cost in the best pens in these experiments was approximately 10½c per pound of broiler.

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"Do Cows Sleep?"

In a featured article appearing in *Hoard's Dairyman* for April 25, 1956, Melvin Schall states that "all cud-chewing animals, including the cow, sheep, goat, and camel, rest but never actually sleep."

Observations of Dr. C. C. Balch of the National Institute for Research in Dairying, University of Reading, England, correlated with others closely associated with ruminants, strengthened the statement that adult cows appear to sleep little if at all. The lack of sleep in ruminants may be due to reticulo-rumen function and the necessity for many hours spent daily in rumination. The question is debatable primarily upon the definition of sleep. Cows do not customarily lapse into a state of marked relaxation, accompanied by loss of consciousness and vision, as does man, or the horse, dog, or cat, which is readily recognized as sleep.

▾ ▾ ▾

Suggestive that the plane of nutrition might be a predisposing factor related to the incidence of infectious bovine rhinotracheitis lies in the observations reported by Chow, *et al.** that 55% of the animals that become ill developed symptoms after 26 to 42 days in the feed lot.

*Chow, T. L., Palotay, J. L., Deem, A. W., Infectious Rhinotracheitis in Feedlot Cattle. *Jour. Am. Vet. Med. Assn.*, 128:348 (Apr. 1), 1956.

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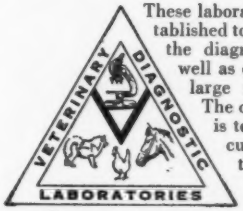

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Names of classified advertisers using V. M. key numbers cannot be supplied. Address your inquiry to key number, care VETERINARY MEDICINE, Suite 803, Livestock Exchange Building, Kansas City 2, Missouri, and it will be promptly forwarded to the advertiser.

To assure inclusion, copy must be supplied by the 5th of the month preceding date of issue (January 5 for February issue: February 5 for March issue, etc.).

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According to a report on intestinal parasitism of man before the American Society of Parasitologists late last year, one of every three children under ten years of age was infected with *Ascaris lumbricoides* at the time of examination. Relative high incidence of *Trichuris trichura* and *Strongyloides stercoralis* were found. Few instances of hookworm infection were noted. Determinations were made from a large collection of samples from persons residing in ten designated areas of eastern Kentucky.

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Dr. Donald A. Eastman
1899-1956

Dr. Donald A. Eastman, well known practitioner and small animal specialist died after a brief illness on April 3, 1956. He had been in poor health for some years.

Doctor Eastman received his D.V.M. from Iowa State College in 1922, thereafter engaging in small animal practice in Cedar Rapids, Iowa and Moline, Illinois. He took an active part in association work and in the organization of the American Animal Hospital Association; serving that group as president (1940-41) and as secretary (1935-40). He disposed of his Iowa and Illinois interests in 1940 and established a clinic and hospital in Miami, Florida.

Surviving are his wife Karin, a son, John, of Mobile, Alabama, and a stepson, John Gosby who is enrolled at Michigan State University as a preveterinary student.

B. B. Roseboom
1884-1956

Benjamin Brokaw Roseboom, 72, died of a coronary thrombosis April 20, 1956, at Boone County Hospital in Columbia, Missouri. Since his retirement in 1949 as head of the Department of Physiology at Michigan State University, he had been professor of veterinary physiology at the University of Missouri.

Professor Roseboom was a graduate of Hamilton College and the University of Chicago. While he did not have a degree in veterinary medicine, his long service as a teacher of veterinary physiology gave him a wide acquaintance with veterinarians. His wife, the former Norma Gilchrest, preceded him in death. He is survived by two sisters, Misses Emma M. and Jessie M. Roseboom of Auburn, New York. Burial was at Auburn, New York.

"Medicine or Turkey Men?"

"Let's be turkey men, not medicine men," advises Charles F. Risher, writing in the 1956 yearbook of the South Carolina Poultry Improvement Association. The author continues by emphasizing that poultry feed medication is not a substitute for good management. Selection of the proper or indicated treatment, the timing and method of administration influence effectiveness of many drugs, even those of proved potency. These fine modern products, developed and produced under most exacting restriction must be used with discrimination else their value tends to be negated.

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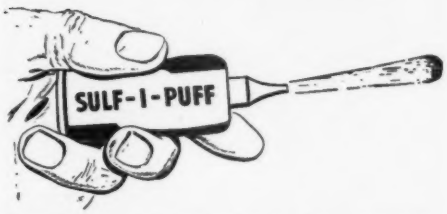
British West Indies Veterinary Conference Planned

The Jamaica Branch of the British Carribbean Veterinary Association has announced plans for a conference to be held in Jamaica July 28-Aug. 8, 1956. It is intended primarily for the benefit of veterinarians in the Caribeban area but veterinarians from the states and other countries are cordially invited. The tentative program includes speakers of prominence from England, Scotland, Canada and the United States.

for Pink-Eye and Surface Infections



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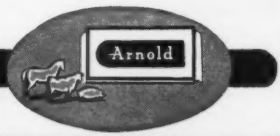

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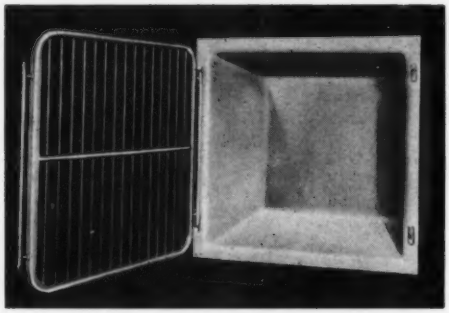

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Faculty Achievement Awards

Dr. Alvin Audis Price, assistant professor of veterinary anatomy of the School of Veterinary Medicine, Texas A. and M. College, was one of five faculty members who received $1,000. Distinguished Faculty Achievement Awards at the college on May 22, 1956.

Dr. Alvin A. Price

The awards were established last year by the Association of Former Students of Texas A. and M. College, to reward outstanding achievements by faculty members in teaching, research, and student relationships.

"The former students of Texas A. and M. College set up these awards to try to express, in a practical manner their appreciation for really fine jobs in teaching, research, or student relationships," L. R. Bloodworth, president of the association, has stated.

"We believe the first function of a good college is to provide good teaching, and that those instructors of outstanding merit should receive tangible recognition for outstanding work," he said.

Dr. Price did his basic work at Tarleton State College, came to Texas A. and M. College for a B.S. in dairy production and received his D.V.M. degree in veterinary medicine at Texas A. and M. College in 1949. Following graduation he was made an instructor in veterinary anatomy and was promoted to assistant professor in 1951.

His citation stated in part: "Dr. Price has given very freely of his time in aiding students individually and in groups."

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Examination of 500 bovine blood samples collected in Kansas revealed that 1% cattle represented were carriers of anaplasmosis. *Earl J. Splitter, D.V.M.*

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Daily Dosage: **½ tablet for animals 2 to 5 lb. in weight, 1 tablet for 5 to 20 lb., 1 to 2 tablets for 20 to 50 lb., and 2 to 3 tablets for larger animals.**

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Non-Nutrient Feed Additives

More non-nutrient additives will find their way into formulated feeds, according to Dr. J. L. Krider, McMillen Feed Mills, Fort Wayne, Ind., writing in *Feedstuff* for May 19, 1956.

Among the forces influencing the trend to more, not less, medicated feed are "customer attitudes." "Many producers of animal products," states Doctor Krider, "are experimenters at heart. They want to try new things even though this may be costly. They want drugs like anticoccidials so they can produce economically with poorer 'housekeeping'; they want the easy way, too. Humans are always looking for miracles."

Growth in the list of medicated feeds and the use of various chemicals having medicinal properties has been tremendous, in some instances tripling in number during the past five years. This trend is expected to continue.

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The *Florida Veterinarian* is credited with the information that three entries of Mrs. Helen Bild in the Miami Orchid Show won a first and two second place awards.

▼ ▼ ▼

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Dr. David Franklin Luckey

1869-1956

Dr. David F. Luckey, OVC '98, spent the greater portion of his professional life in Missouri and was probably one of the first Missouri veterinarians to attain national prominence for his work in regulatory disease control programs. He died at his home in Tarkio, Mo., May 3, 1956.

Doctor Luckey served as State Veterinarian from January 15, 1900 to 1913 and from 1914 until 1922. He inauguarated the system of appointing deputy state veterinarians from among practitioners, a system which is still in use. Deputy state veterinarians were first used in keeping foot-and-mouth disease and contagious pleuro-pneumonia out of Missouri and were later used in all phases of regulatory work.

Outstanding contribution of Doctor Luckey was his persistent efforts to improve tuberculin testing procedures. He was awarded the XII International Veterinary Congress Prize in 1944, "—for his leadership in demonstrating the efficiency of the intradermal test and in bringing about its adoption by the states and eventually by the Bureau of Animal Industry." Doctor Luckey, while state veterinarian, began to use the intradermal tuberculin test on cattle in Missouri in 1908 and made it official in that

Dr. D. F. Luckey

state in 1911. From that point it was adopted rapidly by other states but it was ten years later (1921) before it was finally accepted by the B. A. I. for official use in the bovine tuberculosis eradication project, then four years old. Tuberculosis in cattle could not have been brought under control by use of the thermal tuberculin test with the number of veterinarians available or appropriations likely to have been made. It is not an overstatement to say that the intradermal test introduced by Doctor Luckey made possible one of the notable achievements of American veterinary medicine.

Doctor Luckey also played a major role in obtaining the original Missouri Veterinary Practice Act in 1905 and served as a member of the Veterinary Examining Board for many years. He held Missouri graduate veterinary license Number 2.

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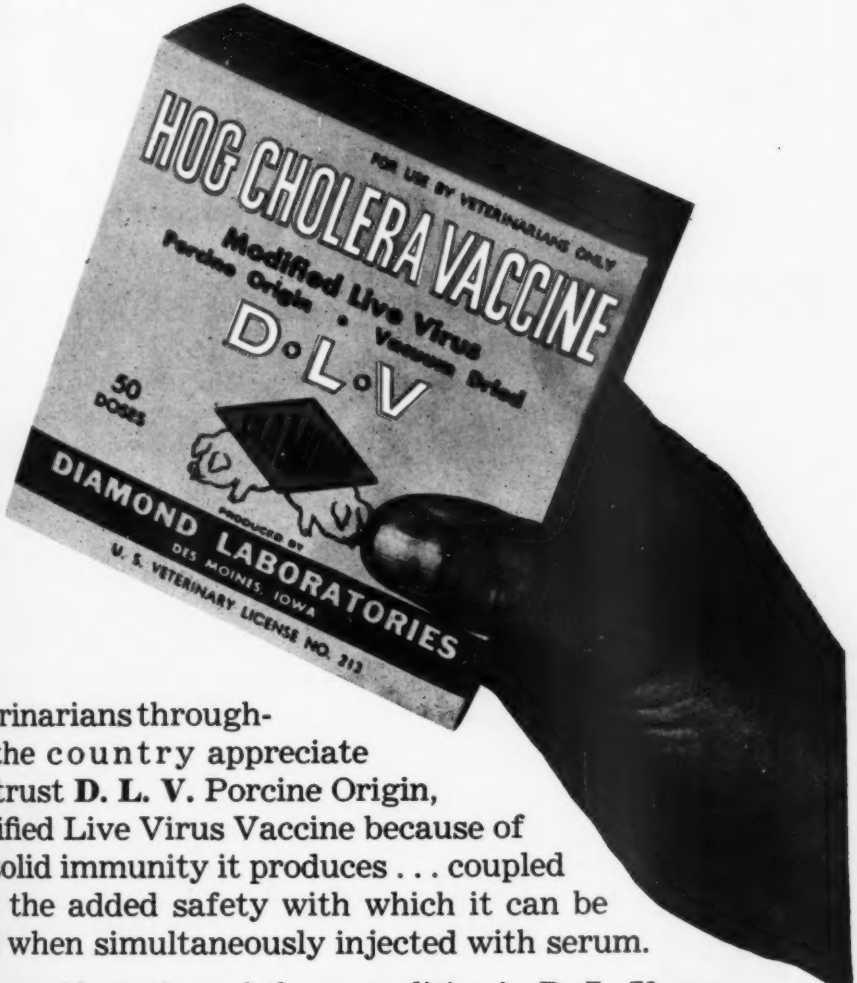

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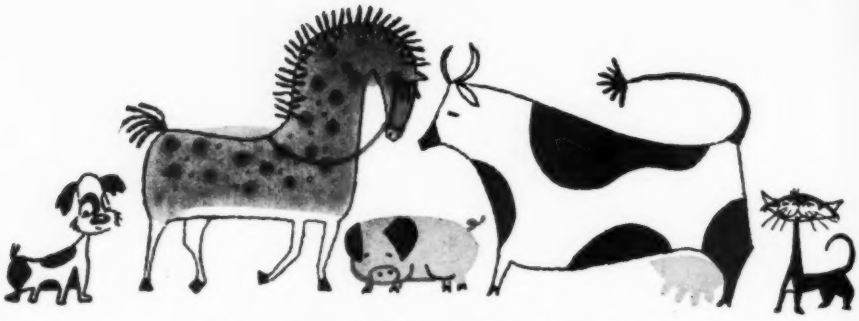

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to prevent bleeding	310 dogs	surgery	clearer operative field[1]
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	185 aged dogs	surgery	an important drug for routine use in all surgical procedures[2]

1. Rachman, M., and Frucht, T. R.: Vet. Med. *49*:341, 1954.
2. Sternfels, M.: Vet. Med. *50*:82, 1955.

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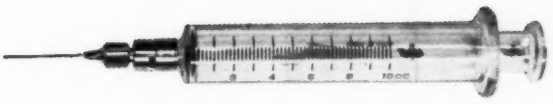

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Sin-jex is the first vaccine to utilize a vacuum-dried modified live virus distemper fraction, with killed virus hepatitis fraction as diluent! This modified live virus distemper fraction elicits a more marked response; hence, Sin-jex assures more positive immunity.

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Research Laboratories, Inc.
St. Joseph, Missouri

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sin-jex
vaccine

GROWN entirely IN GLASS

Viracine is the only tissue cultured hog cholera vaccine. It provides live modified virus completely controlled and checked for virulence, safety and potency! Animal passage plays no part in its modification and has no part in its production. In the face of known exposure to hog cholera, pigs vaccinated as long as three years before with VIRACINE and anti-hog cholera serum have proved to be SOLIDLY IMMUNE.

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Of the three types of live, attenuated hog cholera vaccines on the market today, only one (Viracine—Tissued Cultured) is not available to the layman under one label or another. Viracine is your vaccine exclusively. It comes in 5, 25, and 50 dose packages, complete with diluent. Use Viracine and you'll see the difference—in the clean, white dried vaccine, in the nearly clear, restored vaccine and in the immunity produced in the pig. Only Viracine offers you all these "grown in glass" advantages!

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FOR PROBLEM HERDS **B.T.V.®/CUTTER**
• Safe, too, for pregnant sows • Can't spread hog cholera • Does not throw pigs off feed • No virus setback • Economical to use.

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Cattle feeders now have a choice of methods of using diethylstilbestrol for growth stimulation of beef cattle. One is the widely used premix containing the synthetic hormone to be added to rations and second, the recently approved pellet implant method.

It is claimed that the implanting method, similar to that employed for chemical caponizing, is safe from the standpoint of human health. Several 12 mg. pellets are injected into the subcutis of the ear. The new procedure assures accuracy of dose and makes possible selection of animals most likely to benefit by treatment.

▼ ▼ ▼

A dead pig or one which has nursed the sow are unsatisfactory for identification of leptospirosis. When swine infection is suspected, it may be confirmed by laboratory examination of a live, newly-born pig that has not nursed the sow.—*S. H. McNutt, D.V.M.*

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MEETING CALENDAR

Vermont Veterinary Medical Association. Annual Summer Conference. The Lodge at Smuggler's Notch, Stowe, Vermont, June 21-22, 1956. A. E. Janawicz, Department of Agriculture, Montpelier, secretary.

Michigan State Veterinary Medical Association. Annual meeting. Bancroft Hotel, Saginaw, Mich., June 21-22, 1956. Paul V. Howard, 4011 Hunsberger, N.E., Grand Rapids, secretary.

North Carolina Veterinary Medical Association. Annual meeting, Greensboro, N. C., June 25-27, 1956. C. J. Lange, 3741 Hi-Pt. Rd., Greensboro, secretary-treasurer.

Maritime Veterinary Associations. Joint conference. June 26-28, 1956, Mount Allison University, Sackville, New Brunswick. J. F. Frank, Sackville, secretary joint committee.

Maryland State Veterinary Medical Association. Annual summer meeting. George Washington Hotel, Ocean City, Md., June 28-29, 1956. John D. Gadd, Cockeysville, secretary.

Mississippi State Veterinary Medical Association. Annual meeting. Buena Vista Hotel, Biloxi, Miss., July 15-17, 1956. Harvey F. McCrory, Box 536, State College, Miss., secretary.

Kentucky Veterinary Medical Association. Forty-fifth annual meeting. Seelbach Hotel, Louisville, Kentucky, July 16-17, 1956. Dr. Robert H. Singer, 136 Shawnee Place, Lexington, Ky., secretary.

Iowa State College Annual Conference for Veterinarians. Memorial Union, Iowa State College, Ames, Ia., July 17-18, 1956. Drs. John B. Herrick and D. L. Baker, chairmen.

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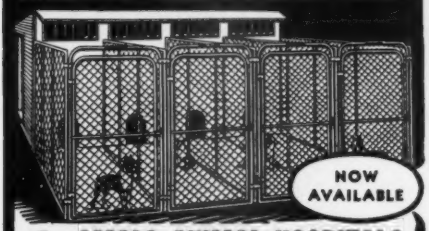

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500 mg. Sulfamerazine, Microcrystalline
500 mg. Sulfathiazole, Microcrystalline
7.5 mg. Cobalt Sulfate
50 mg. PAPAIN

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in 1-gross lots	41.76 per gross	29¢ per tube
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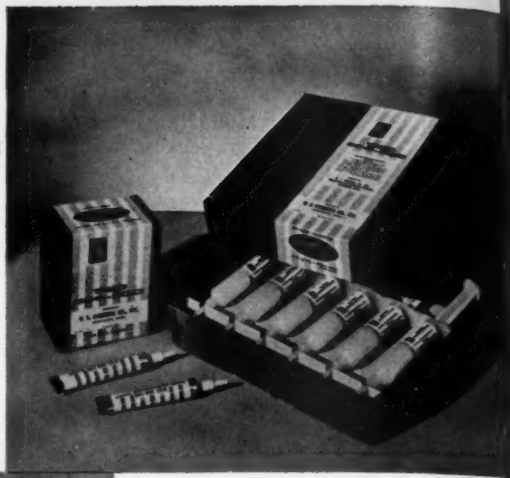

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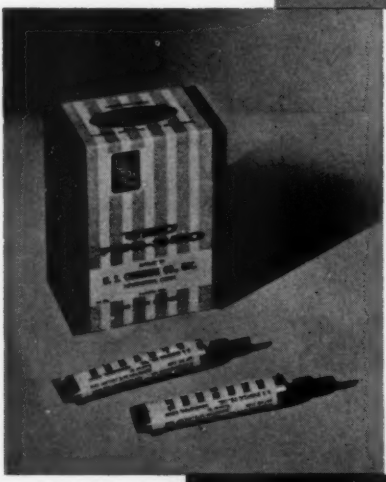

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7.5 mg. Cobalt Sulfate
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750 mg. Sulfathiazole, Microcrystalline
7.5 mg. Cobalt Sulfate
50 mg. PAPAIN

28cc TUBES	$ 5.94 per doz.	49.5¢ per tube
in 1-gross lots	64.80 per gross	45¢ per tube
in 3-gross lots	59.04 per gross	41¢ per tube
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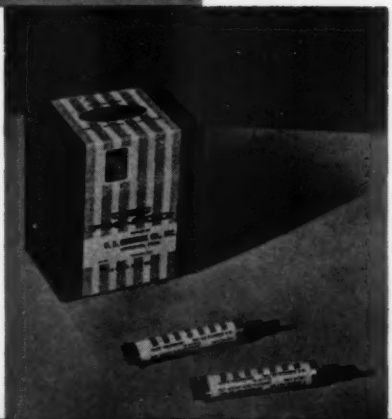

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6-4 oz. **$4.20**

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Virginia Veterinary Medical Association. Semiannual meeting. Natural Bridge Hotel, Natural Bridge, Va., July 17-19, 1956. Wilson B. Bell, 1303 Hillcrest Drive, Blacksburg, secretary.

Alabama Polytechnic Institute Annual Conference for Veterinarians. School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn, Ala., July 22-25, 1956. R. S. Sugg, dean.

Michigan State University College of Veterinary Medicine. Conference on radiology for veterinary practitioners. Kellogg Center, M.S.U. campus, East Lansing, Mich., August 7, 1956.

Pennsylvania State University. Annual Health Conference. State College, Pa., August 21, 1956. Dr. Ernest J. Witte, Chief, Division of Veterinary Public Health, Harrisburg, Pa.

Pennsylvania State Veterinary Medical Association. Annual meeting. Bedford Springs Hotel, Bedford, Pa., September 12-14, 1956. Raymond C. Snyder, N.W. Corner Walnuts St. and Copley Rd., Upper Darby, Pa., secretary.

Washington State Veterinary Medical Association. Annual meeting. Davenport Hotel, Spokane, Sept. 21-22, 1956. P. J. Pfarr, 6306 N. Wall, St. Spokane, general chairman.

Oklahoma Conference for Veterinarians. School of Veterinary Medicine, Oklahoma A & M College, Stillwater, September 27-28, 1956. A. L. Malle, Department of Veterinary Pathology, chairman.

Eastern Iowa Veterinary Association. Annual meeting. Hotel Montrose, Cedar Rapids, Ia., October 4-5, 1956. Forrest B. Brutsman, Traer, secretary.

University of Missouri. Thirty-second annual Short Course for graduate veterinarians. Columbia, Mo., Oct. 1-2, 1956. Dr. Cecil Elder, chairman.

South Dakota Veterinary Medical Association. Annual meeting. Hotel Cataract, Sioux Falls, S. Dak., Oct. 4-5, 1956. Dr. J. L. Noordsy, Marion, S. Dak., secretary.

American Veterinary Medical Association. Annual meeting. Municipal Auditorium, San Antonio, Tex., October 15-18, 1956. J. G. Hardenbergh, 600 S. Michigan Ave., Chicago, Ill., executive secretary.

Southern Veterinary Medical Association will hold their 1956 Annual meeting in conjunction with the American Veterinary Medical Association convention at San Antonio, Texas, Oct. 14-18, 1956. Dr. A. A. Husman, Raleigh, N. C., secretary.

United States Livestock Sanitary Association, 60th annual convention, Hotel Morrison, Chicago, Ill., Nov. 28-30, 1956. Dr. R. A. Hendershott, 33 Oak Lane, Trenton 8, N. J., secretary.

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Gaines Veterinary Symposium

The sixth annual Veterinary Symposium, Newer Knowledge About Dogs, is scheduled for Wednesday, October 24, 1956, at Kankakee, Illinois. Dean Robert Graham, School of Veterinary Medicine, University of Illinois, will preside as at all previous sessions.

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